SEP 21 '48

ENGINEERING NEWS-RECORD

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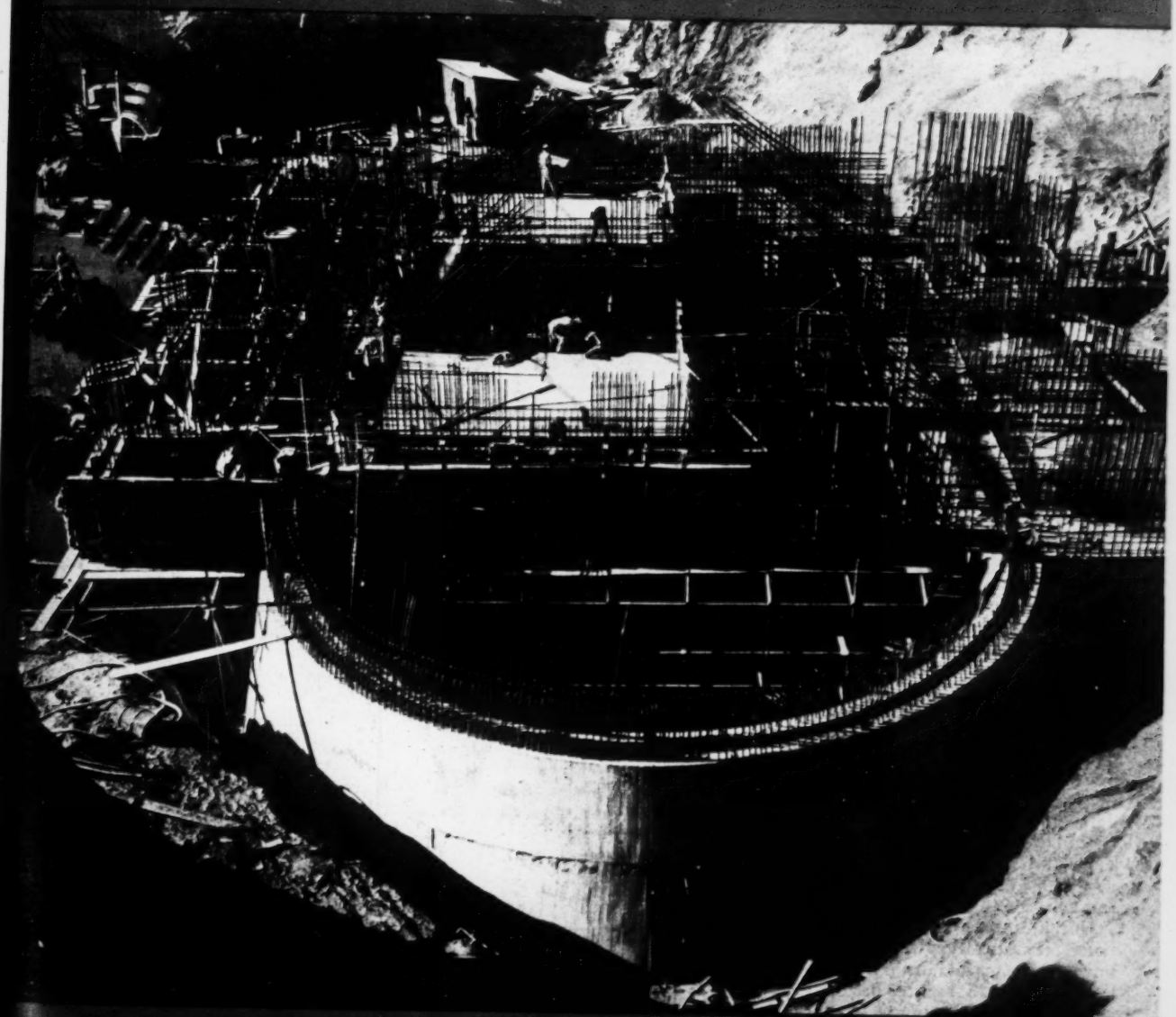
SEPTEMBER 16, 1948

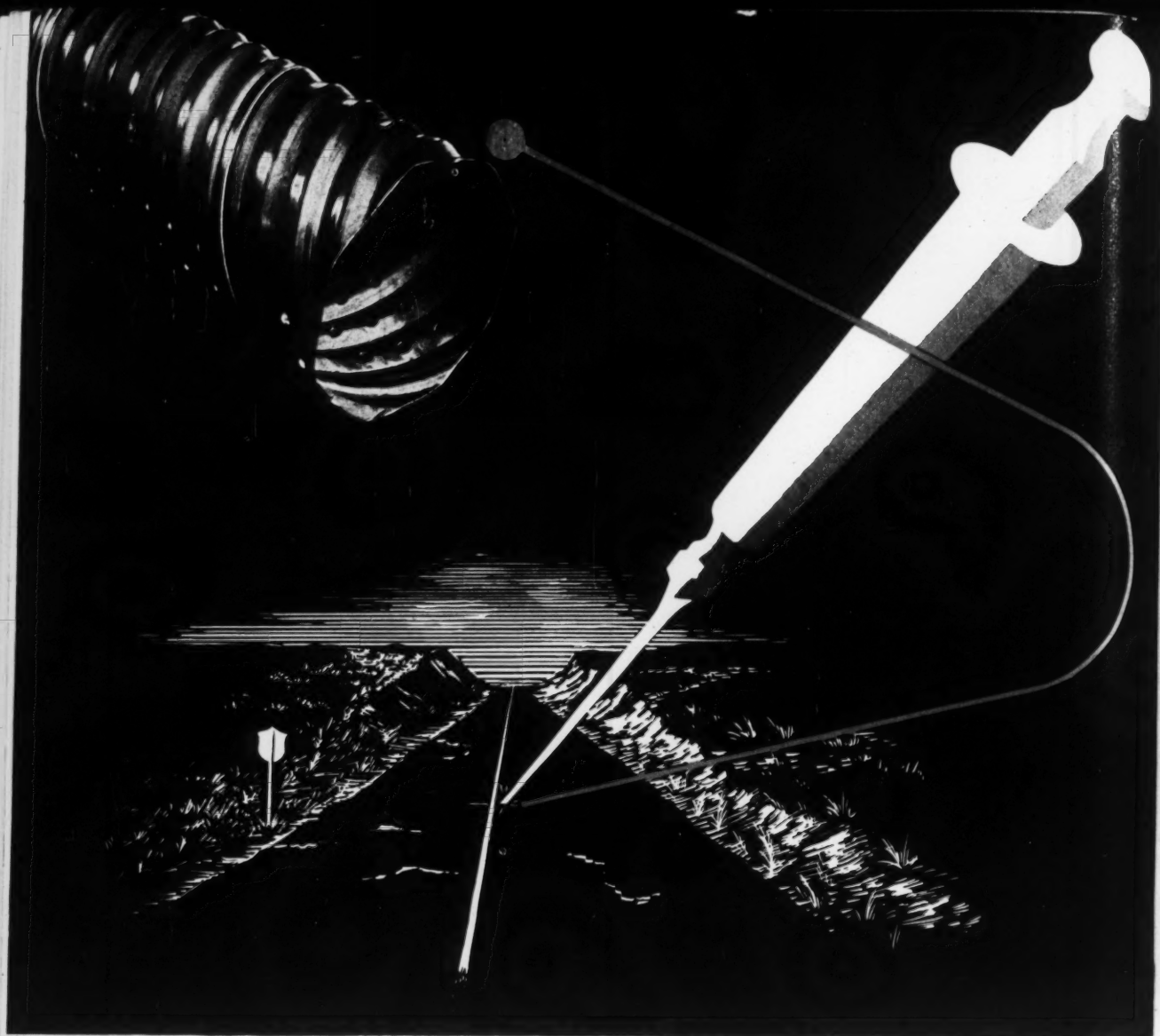


Massive concrete base of Granby pumping station on the Colorado—Big Thompson project

WITH ARTICLES ON:

TESTING BACKFILL CONSOLIDATION METHODS

CHINA USES HAND LABOR TO BUILD POWER DAM



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An index for Volume 140 (January-June 1948) is now ready for distribution. Copies will be mailed to subscribers who ordered an index for any Volume since 135. Subscribers who did not order a copy of that index or who have changed their address should return this coupon to

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WESTERN'S ANSWER TO CORROSION OF H-BEAM PILES

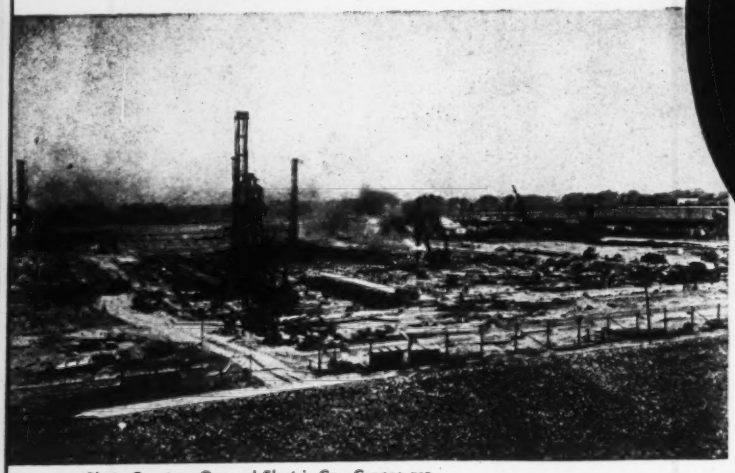
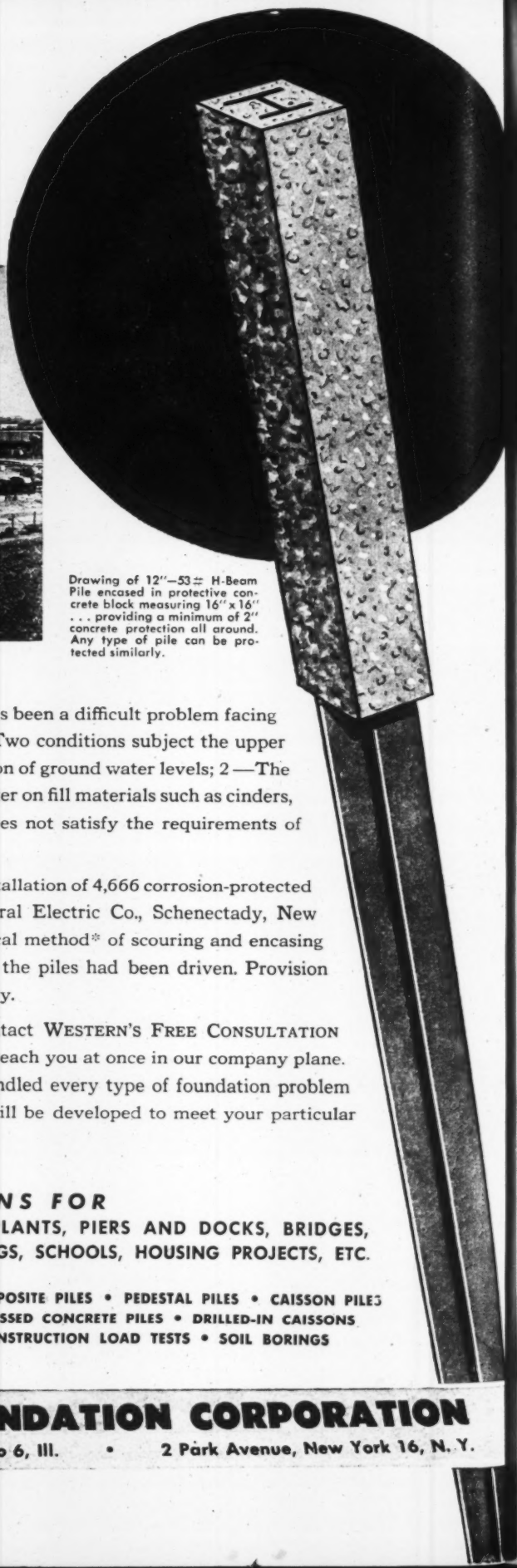


Photo Courtesy General Electric Co. Cranes are driving corrosion-protection for H-Beam Piles.



Drawing of 12"—53# H-Beam Pile encased in protective concrete block measuring 16" x 16" . . . providing a minimum of 2" concrete protection all around. Any type of pile can be protected similarly.

The protection of H-Beam Piles against corrosion has been a difficult problem facing engineers who wished to specify this type of pile. Two conditions subject the upper section of the piles to heavy corrosion: 1 — Fluctuation of ground water levels; 2 — The highly corrosive acids formed by the action of the water on fill materials such as cinders, garbage, etc. Protective paint has been tried but does not satisfy the requirements of many engineers.

WESTERN successfully met this problem in the installation of 4,666 corrosion-protected H-Beam Piles for the new Turbine Building, General Electric Co., Schenectady, New York. WESTERN devised an economical and practical method* of scouring and encasing the upper 10 to 30 ft. of the beam in concrete after the piles had been driven. Provision is made in this method to pour the concrete in the dry.

DO YOU HAVE A FOUNDATION PROBLEM? Contact WESTERN'S FREE CONSULTATION SERVICE for fast action. One of our engineers will reach you at once in our company plane. He will speak with authority, for WESTERN has handled every type of foundation problem since 1924. Wherever necessary, new techniques will be developed to meet your particular problem. Ask for Catalog A.

* Patent Pending.

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(On carload lots, ¢ per cwt.)

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	Lackawanna,* N. Y.	Bethlehem, Pa.	Phoenixville,**a Pa.	Steelton,a Pa.	Williamsport,a Pa.	Johnstown,b Pa.	Pittsburgh Area: Munhall, Pa.	Braddock, Pa.	Clairton, Pa.	Aliquippa, Pa.	Sparrows Pt.,c Md.	Weirton,d W. Va.	Youngstown Area: Youngstown,d O.	McDonald,d O.	Campbell,d O.	Chicago Area: Gary, Ind.	Chicago, Ill.	Indiana Harbor, Ind.	Birmingham Area: Fairfield, Ala.	Bessemer, Ala.	Gadsden, Ala.	Houston,d Tex.	Pueblo, Colo.	Geneva, Utah	Fontana, Calif.	Los Angeles,e Calif.	Torrance,e Calif.	San Francisco,e Calif.	Seattle,e Wash.
Mill prices, $ per cwt.	$ 3.30	$ 3.30				$ 3.30	$ 3.25	$ 3.25	$ 3.25	$ 3.25		$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 3.25	$ 5.75	$ 4.30	$ 3.85	$ 4.30	$ 4.30
Boston, Mass.	57	48	52	56	57	64	69	67	67	67	56																		
New York, N. Y.	53	26	31	36	40	49	56	56	56	56	38																		
Philadelphia, Pa.		18	14	30	36	44	49	49	49	49	26																		
Baltimore, Md.		33	25	25	36	42	47	47	47	47	6½																		
Pittsburgh, Pa.				40	38	23	0	0	0	0		14	20	20	20														
Cleveland, O.	36				48	38	31	31	31	31		30	21	21	21														
Detroit, Mich.	40						46	46	46	46		46	39	39	39														
Cincinnati, O.							46	46	46	46		46	46	46	46														
Chicago, Ill.												57	53	53	53	0	0	0											
St. Louis, Mo.												66	64	64	64	38	38	38											
Minneapolis, Minn.													79	79	79	59	59	59											
Atlanta, Ga.																			36†	36†	36†								
Birmingham, Ala.																			3.75	3.75	3.75								
New Orleans, La.																			55	55	55	31							
Denver, Colo.																117†	118†						30†	80†					
Los Angeles, Calif.																								58	18	0	0		
San Francisco, Calif.																								60†	32†	32†	32†	0	
Seattle, Wash.																								65				60	0

* Freight rate from Buffalo, N. Y.
** Freight rate from Coatesville, Pa.
† Includes 3% Federal Tax.

a Not rolling structural shapes. *b* Rolling small shapes only. *c* Plates only. *d* Rolling very small quantities. *e* Rolling bar shapes only.

You can't see the most important item

QUALITY isn't listed on the assembly drawing; but it *is* built into every W&T Chlorinator. It's there because neither you nor we want to take chances with the protection of public health—one of chlorination's important roles in water supply, sewage treatment and swimming pools. In their many industrial uses, too, from controlling slime in paper mills to preventing spoilage in food processing, you'll find this same craftsmanship and careful manufacturing—the kind that keep W&T chlorinators on the job economically year after year.

So when chlorination is indicated look to dependable W&T equipment, backed by over thirty years' experience, if you want the kind of installation your client will still thank you for 10 or 20 years from now.

S-29

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CHLORINE AND CHEMICAL CONTROL EQUIPMENT

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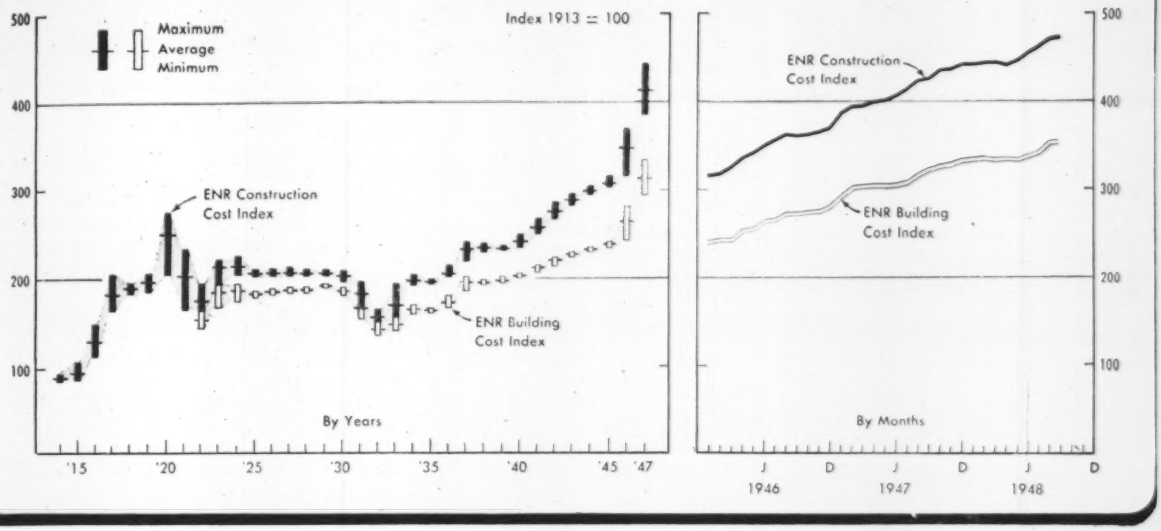
SEPTEMBER CONSTRUCTION BUSINESS REPORT

ENGINEERING NEWS-RECORD CONSTRUCTION AND BUILDING COST INDEX TRENDS



ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

Thousands of Dollars (,000 omitted)	August 1947 (4 wk.)	August 1948 (4 wk.)	% Change	Eight Months 1947 (35 wk.)	Eight Months 1948 (35 wk.)	% Change
Total U. S. Construction	$413,494	$560,292	+36	$3,611,597	$4,607,380	+28
Private Construction	222,772	229,515	+3	2,018,528	2,211,380	+10
Public Construction	190,722	330,777	+73	1,593,069	2,396,000	+50
Federal	44,398	77,560	+75	453,073	679,609	+50
E N R Construction Volume Index, 1913 = 100	211	254	+20	222	252	+14
Total New Productive Capital	$96,747	$246,934	+155	$2,368,393	$4,930,725	+108
Private Investment	96,747	181,934	+88	1,301,953	2,879,504	+121
Federal (non-federal work)	.....	65,000	.....	247,711	492,289	+99
Federal (federal work)	.....	.....	.....	818,729	1,558,932	+90

CONSTRUCTION COST . . . WAGE RATES . . . MATERIAL PRICES

1913 = 100	September 1947	September 1948	% Change	Change August to September 1947 Aug.	1947 Sept.	1947 %	1948 Aug.	1948 Sept.	1948 %
E N R Constr. Cost Index†	426.38	476.80	+11.83	422.85	426.38	+0.83	475.51	476.80	+0.27
E N R Building Cost Index†	322.58	356.70	+10.58	317.75	322.58	+1.52	355.45	356.70	+0.35

† *Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES' AVERAGE

Common Labor	$1.237	$1.393	+12.61	$1.237	$1.237	0.0	$1.386	$1.393	+0.51
Skilled Labor (Av. 3 Trades)	2.100	2.318	+10.38	2.081	2.100	+0.91	2.298	2.318	+0.87
Bricklayers	2.246	2.516	+12.02	2.227	2.246	+0.85	2.504	2.516	+0.48
Structural Ironworkers	2.117	2.303	+8.79	2.079	2.117	+1.83	2.290	2.303	+0.57
Carpenters	1.938	2.158	+11.35	1.938	1.938	0.0	2.124	2.158	+1.60
Cement, bulk, per barrel	2.63	2.94	+11.79	2.54	2.63	+3.54	2.92	2.94	+0.68
Structural Steel, base	2.80	3.25	+16.07	2.80	2.80	0.0	3.25	3.25	0.0
Sand, per ton	1.814	2.035	+12.18	1.797	1.814	+0.95	2.015	2.035	+0.99
Lumber, 2x4 Fir, per M ft.	90.32	99.12	+9.74	88.05	90.32	+2.58	99.44	99.12	−0.32
Lumber, 2x4 Pine, per M ft.	81.64	85.23	+4.40	77.91	81.64	+4.79	86.47	85.23	−1.43
Common brick, per M	23.538	26.963	+14.55	23.200	23.538	+1.46	26.238	26.963	+2.76
Ready-mixed concrete, c.y.	9.187	10.148	+10.46	9.018	9.187	+1.87	10.079	10.148	+0.68
Struct. clay tile, 3x12x12	119.58	126.87	+6.10	118.41	119.58	+0.99	124.19	126.87	+2.16

MATERIAL SHIPMENTS . . . BUILDING PERMITS

	August 1947	August 1948	% Change	July 1948	% Change July to August
Steel (% operating Capacity) A.I.S.I., weekly average	93.6	94.6	+1.1	92.4	2.4

	June 1947	June 1948	% Change	Six Months 1947	Six Months 1948	% Change
Cement, thous. bbl. U.S.B. of Mines	18,179	21,426	+17.9	77,883	91,517	+17.5

	July 1947	July 1948	% Change	Seven Months 1947	Seven Months 1948	% Change
Fabricated Structural Steel, tons, A.I.S.C.	169,911	135,584	−20.2	1,048,740	1,101,243	+5.0
Building Permits, 215 Cities, Dun & Bradstreet (,000 Omitted)	$282,246	$346,324	+22.7	$1,565,028	$2,306,571	+47.4

COST OF LIVING INDEX . . . EMPLOYMENT

Base 1935–39 = 100		July 1947	July 1948	% Change	June 1948	% Change June to July
Consumers' Price Index, B L S	105.2	158.4	173.7	+9.7	171.7	+1.2
Rent (Housing) Index, B L S	106.2	110.0	117.3	+6.6	117.0	+0.3

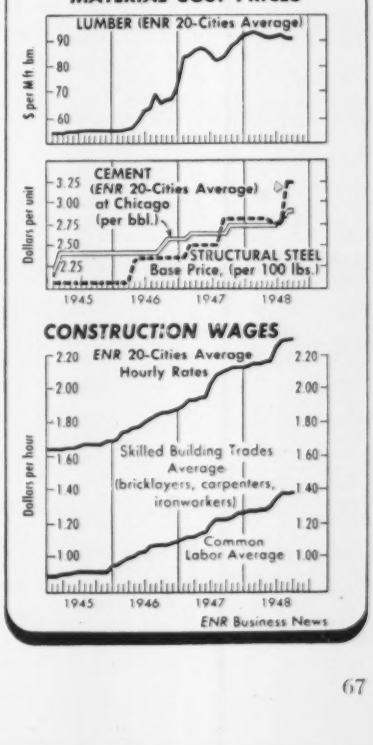
	July 1947	July 1948	% Change	June 1948	% Change June to July
Contract Constr. Employ. (est.), thous., B L S	2,043	2,186	+7.0	2,164	+1.0

ENR INDEX NUMBERS

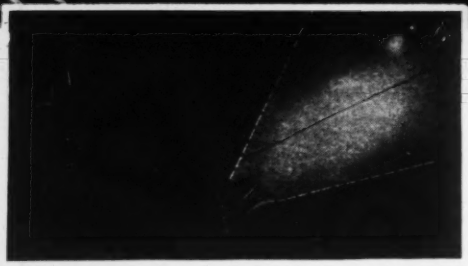
Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Sept., 1948	476.80	229.20	356.70	192.82	...	...
Aug., 1948	475.51	228.58	355.45	192.15	254	111
July, 1948	463.23	222.67	342.42	185.10	*266	*117
June, 1948	455.80	219.10	339.26	183.39	282	124
May, 1948	447.86	215.29	333.93	180.51	258	113
Apr., 1948	443.64	213.26	334.56	180.85	302	132
Mar., 1948	443.60	213.24	334.22	180.67	247	108
Feb., 1948	442.67	212.79	335.49	181.36	231	101
Jan., 1948	441.65	212.30	333.58	180.32	173	76
Dec., 1947	441.13	212.05	333.06	180.04	246	108
Nov., 1947	436.91	210.02	329.22	177.97	234	103
Oct., 1947	434.58	208.90	327.29	176.92	228	100
Sept., 1947	426.38	204.96	322.58	174.38	250	110
1947 (Av.)	413.16	198.61	312.96	169.18	228	100
1946 (Av.)	346.04	166.34	262.35	141.82	248	109
1945 (Av.)	307.75	147.93	239.14	129.27	123	54
1944 (Av.)	298.72	143.59	234.73	126.89	96	42

* *Correction.*

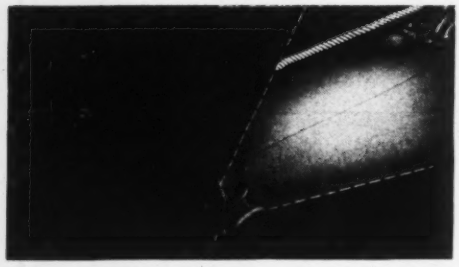
MATERIAL COST PRICES



You Can CURB ACCIDENTS with ATLAS WHITE REFLECTING CURB



A smooth curb wastes the car's headlights. It reflects light away from the driver. Edge of road is difficult to see. Driving dangers are increased.



White Concrete Reflecting Curb utilizes the car's headlights. Saw-tooth faces mirror the light back to driver; form a continuous, bright ribbon of light at the road's edge. Driving is safer.

Inadequate visibility is the cause of many of today's highway accidents. A smash-up may occur when a driver misjudges the curb when passing a big truck . . . a driver trying to make time may fail to note a sudden curve in the road. White Concrete Reflecting Curb made with Atlas White Cement outlines the road ahead, increases visibility, and *tends to reduce accidents*.

Atlas White Reflecting Curb has high visibility. It outlines the roadway in daylight . . . clearly defines the road's edge at night. Its saw-tooth faces catch the headlight rays and reflect them back to the driver, forming a continuous ribbon of light ahead of the car. And on rainy nights, this curb is even more mirror-like . . . gives even higher visibility just when needed most.

Send for full details. Write to Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

ENR-RM-84

ATLAS WHITE CEMENT

For White Concrete Reflecting Curb

News of the Week

ENGINEERING NEWS-RECORD • SEPTEMBER 16, 1948 • VOLUME 141 • NUMBER 12

Reshuffling of Navy bureau aimed at greater efficiency

Yards and Docks organization changes include combining two departments and adding of one new unit—name assistant chiefs, district engineers, public works officers

Navy's Bureau of Yards and Docks streamlined its organization in fiscal 1948 to free its headquarters officers of time-consuming detail and put its field operations in the districts on a more efficient basis. Main-office reorganization, consisting of a regrouping of divisions under four assistant chiefs of the bureau, has been accomplished, and revamping of the field functions is approaching completion.

Changes at Washington headquarters are notable in two respects: (1) the former construction department and the planning and design department are pulled together under the new office of the Assistant Chief for Operations, and (2) a new unit is created in the Office of the Assistant Chief for plans and research. The latter office has under it a planning division and a research division. Its functions are a significant indication of the bureau's intensified activity in the field of research and development.

For all practical purposes, the other two new offices—of assistant chiefs for administrative management and business management—have taken over without much change the former departments: (1) finance and operating, and (2) administration and personnel.

Name assistant chiefs

Officers serving as assistant chiefs at present are: Operations, Capt. W. O. Hiltabidle; Plans and Research, Capt. Edward E. Saunders; Administrative Management, Capt. W. B. Short; Business Management, Capt. R. H. Meade. All are regular officers except Captain Saunders, in charge of research and planning; he is a reserve officer.

Reorganization of field functions involved three principal changes: (1) creation of a new post of district civil engineer on the staff of the commandant in each district; (2) relieving the district public works officer of his purely staff duties—now assigned to the district civil engineer—thus centering all his responsibilities on the operations of the district public works office; and (3) apportioning the former functions of the superintending civil engineer and the civil works engineer to the district civil engineer and the district public works officer. The new organization plan, of course, eliminates the two posts thus stripped of their duties.

As outlined by Rear Adm. J. J. Manning, Chief of the Bureau of Yards and Docks, the new assignment of functions carries out the intent to place staff responsibilities on the district civil engineer and operating functions under the district public works officer. The district public works office is described as an activity separate from the staff but attached to the headquarters.

Duties defined

The district civil engineer serves exclusively as a staff officer for the commandant and acts as his assistant on all matters relating to public works and utilities. As such, he: (1) investigates the civil engineering aspects of shore activities, (2) advises the commandant regarding the public works organization, (3) reviews the requirements of public works activities for Bureau of Yards and Docks funds, (4) maintains data on public works construction in the district by the Navy and by other services or agencies, (5) keeps information up to date on marine and harbor facilities, (6) acts as consultant on plans for shore facilities, (7) maintains contact with all engineering and construction agencies and groups, public and private, (8) advises on Seabee training and procedures in the district, both regular and reserve, (9) prepares and reviews engineering reports, and (10) helps the commandant coordinate the Navy's public utilities in the district.

(*Continued on* p. 71)

WAA to close with small surplus stock

The war-surplus property barrel, once jammed with $28,000,000,000 worth of plants, producer and consumer goods, and aircraft, is nearly empty. By next Feb. 28, when War Assets Administration goes out of business, all but a handful of plants and an accumulation of metallic "junk" nobody wants will have been sold.

Of the 1,210 industrial plants, originally worth $9,000,000,000, about 900 have been wholly or partially disposed of or leased. Only 231 remain in inventory and of these about 150 carry the national security clause which is intended to keep vital industrial plants in "standby" condition in case of another war.

So these unsold plants, and the rented properties, constitute a $4,000,000,000 white elephant that will be handed over to the Reconstruction Finance Corporation next year. WAA's office of real property disposal has available a catalog of plants and property which are now up for sale.

Only about $410,000,000 worth of personal property—machinery, hardware, raw materials and airplane parts—remains in the bin which once held about $19,000,000,000 worth (acquisition cost) of this type of government surplus material.

In order to speed up disposal of the remaining personal property, WAA has dropped most priorities and preferences formerly given by law to federal agencies, veterans, state and local governments and their instrumentalities, and non-profit health and education institutions. Priority dealings in real property will continue to be in effect, however.

The 11 classes of commodities making up the $410,000,000 bin are controlled by 10 regional offices. The offices are: New York, Cincinnati, Chicago, Philadelphia, Kansas City, San Francisco, Atlanta, Grand Prairie, Tex., Seattle, and Denver.

NEWS BRIEFS

Labor—Carpenters and laborers of *Spokane, Wash.*, have forced a 15 to 21-cent hourly wage increase by leaving that city for central and eastern Washington sections where the higher rate was already in effect . . . Bricklayers in the *New York City* area have recently heard a decision of the Supreme Court of New York County making the eight-hour day mandatory upon request of the contractor. Rates were set to total $27 a day for the eight hours. . . . In a cooperative effort, the Department of Labor and Veteran's Administration have completed a two-year study which found disabled workers more efficient than the unimpaired.

Highways—*Pennsylvania* roads cost $150,000 per mile at present day prices, say highway department officials in emphasizing need for increased gasoline taxes. . . . Snow removal in *South Dakota* cost half a million dollars last winter, according to a recent report. . . . Contracts let by *North Dakota* for highway work will total $10,000,000 in 1948, is the latest state highway department prediction. . . . Reconstruction, resurfacing and oiling 84 miles of *Alaskan* highways will be let in two contracts for which bids will be opened Sept. 22 at *Portland, Ore.* . . . Increase in state gasoline tax and introduction of a Diesel fuel tax have been considered by Montana as a means of matching its $10,000,000 federal aid allotment.

Public Construction—Low bidder on the second phase of *Philadelphia's* subway extension was the Golder Construction Co. with a $5,900,000 price for the track and station work involved. . . . Dudley Construction Co. of *Great Falls, Mont.*, received the contract for the new $1,000,000 state office building at *Helena*. . . . Plans for a $3,292,000 expansion of Albany Hospital, at *Albany, N. Y.*, include a seven-story wing, and await federal aid. . . . Two *Illinois* hospitals, at *Jacksonville* and at *Carlinville*, will cost $11,000,000 and provide a total of 180 beds.

Water Supply and Sewerage—*Kansas City, Mo.*, has placed in operation the first two-and-a-half-mile section of its new $7,500,000 water main system. . . . Representatives of *Indiana's* industries and the state governments of *Indiana* and *Illinois* have met and approved planned expenditures of $15,000,000 on industrial sewage disposal plants. . . . *Honolulu, T. H.*, invites mainland bids on a pumping station—the fifth phase of a $20,000,000 sewer construction program.

Industrial Construction—Application has been made by the Virginia Electric and Power Co. for a license to build an $18,000,000 dam and hydro-electric plant on the Roanoke River, in *North Carolina*. This will bring the total cost of Vepco projects to $53,000,000. . . . A $15,000,000 power plant to be known as the Tanners Creek plant, will be constructed at *Lawrenceburg, Ind.*, as part of the $55,000,000 expansion program of the Indiana and Michigan Electric Co. . . . Central Maine Power Co's new dam on the Dead River will form a 26-mile-long lake for storage purposes and inundate two *Maine* villages. Preliminary construction work has already begun. . . . Clemmer Construction Co. of *Akron, Ohio*, has been awarded the contract for building a new Akron station for the Pennsylvania and Baltimore & Ohio Railroads at a cost of $2,000,000. . . . Initial construction will begin soon on the Georgia Power Co's 100,000-kw. unit at a cost of $10,500,000 on the Chattahoochee River in *Coweta County, Ga.* Eventually to be of 400,000 kw. capacity, the largest in the South, the plant will provide power for Atlanta, Newnan, La Grange and West Point.

Jailed for contempt in registration fight

Raymond D. Hulslander, president and owner of all stock of Aimes Co., Inc., 2424 Euclid Avenue, Cleveland, which is advertised as a mechanical and structural engineer company, was fined $500 and sentenced to ten days in jail September 2 by Common Pleas Judge James Connell when found guilty of contempt of court.

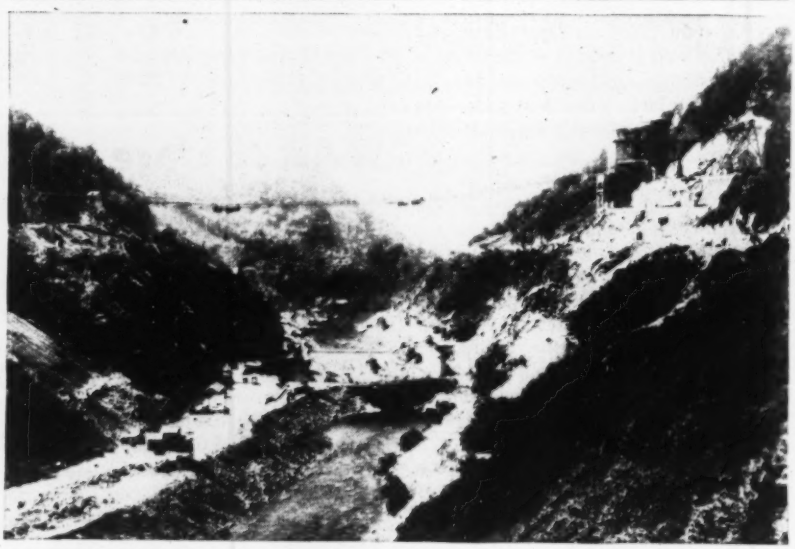
Hulslander — and the Aimes Co. — was ordered by a court decree November 12, 1947 to cease representing himself as professional engineer until he could comply with Ohio's 15-year engineering registration law.

Hulslander under cross examination admitted he was not an engineering graduate of an accredited school nor did he have in the employ of Aimes Co. a registered engineer at this time.

Action against Hulslander was instituted by the Ohio Society of Professional Engineers. It was for contempt of the November court order that Hulslander was fined and jailed.

Attorneys for Hulslander posted appeal bond September 3 which will enable the defendant to carry the case to the higher Court of Appeals and will also free Hulslander from jail.

The court sentence was the first such to be meted out.



AMERICAN CABLEWAYS, FRENCH DAM—While visitors at the Road Show in Chicago recently were viewing the one-twelfth scale working model of the tautline cableway in the exhibit of Sauerman Bros., Inc., the two 25-ton machines that inspired Lou Dierks, company vice-president, to build the model were at work on one of France's great new dams. Chastang Dam, on the Dordogne River, pictured here, will turn out over 500 million kw.-hr. annually, second only to Genissiat in France. An arch-gravity type, it will be 250 ft. high and require 330,000 cu.yd. of concrete. The cableways, with movable head and tail towers, have a span of 1,146 ft. and their 3-in. locked-coil track cables carry 8-yd. buckets, 5-yd. skips or slings for handling 20-ton sections of penstock.

Col. Wanamaker named engineer, N. Y. district

On Sept. 1 Col. W. W. Wanamaker took command as district engineer of the New York district Corps of Engineers, succeeding Col. Charles F. Williams. Colonel Wanamaker was graduated at West Point in 1918. He served overseas in the first world war. From 1928 to 1943 he served in various capacities for the Corps of Engineers, including two years as assistant district engineer at Boston, three years in a similar capacity at St. Louis and two years in the Southwestern division. He was district engineer at Denison, Tex., during construction of Division Dam.

In 1944 he was sent to New Guinea and was task force engineer in the invasion of the Admiralty Islands. He then became chief transportation officer of Services and Supply of the Southwest Pacific Theater of War, and later was promoted to brigadier general. He was assigned to the first occupation forces of the Eighth Army in Japan. In January, 1946, he was assigned to the Missouri River engineer division, and organized the Garrison engineer district, to construct the $200,000,000 Garrison Dam. In Aug., 1947, he was assigned district engineer of the Baltimore district.

He will direct construction of five

Col. W. W. Wanamaker

veterans' hospitals, flood control projects, the maintenance and improvement of rivers and harbors and the construction of camps, posts and air fields in N. Y., N. J., and Del.

Engineers establish new Walla Walla district

Lt. Gen. Raymond A. Wheeler, Chief of Engineers, announced last week that accelerated flood control and rivers-and-harbors work in the Northwest has prompted establishment of a new engineer district with headquarters at Walla Walla, Wash. Col. William Whipple, present executive officer of the North Pacific Division, will be district engineer.

Effective Nov. 1, the new district will cover part of the present Portland Ore., District and will be known as the Walla Walla district. It will have charge of all Corps of Engineer activities in the mid-Columbia River and Snake River basins, including the construction of the $227,000,000 McNary multi-purpose dam on the Columbia and the series of multi-purpose dams authorized by Congress for the Snake River below Lewiston, Idaho. The district will function under the jurisdiction of the North Pacific Engineer Division.

The new district will take part of the heavy load on the Portland District, General Wheeler said. The Portland district is now one of the largest in area in the United States, with more than 2,900 employees.

Navy regroups bureau for efficiency

(*Continued from* p. 69)

Operational duties of the district public works officer cover a broad range. Some of his important responsibilities are: (1) Administration of contracts for bureau and civil works projects on which the chief of the bureau names him officer-in-charge; (2) engineering and architectural design of public works and utilities, as directed by the chief of the bureau; (3) investigation of sanitary and fire protection facilities; (4) preparation of technical reports and studies; and (5) occasional duties for other district activities in preparing budget estimates, making surveys and inspecting public works and utilities. In addition, he supplies from his office the professional and technical help needed by the district civil engineer in making staff studies and reports.

Reorganizing of district functions in accordance with the new plan has been in progress since last spring. The work load in each district and the availability of officers determines whether the duties of district civil engineer and public works officer shall be assigned separately or in combination.

Appointments thus far

Up to the present, not all appointments have been made, and few—if any—have been confirmed. A number are known to be temporary. As of last week, the assignments were as follows—the district civil engineer being designated (1) and the public works officer (2), with combined functions for a dual job shown as (1-2):

First Naval District, Boston, Capt. H. E. Wilson (1-2); Third District, New York, Capt. H. R. Lacey (1-2); Fourth District, Philadelphia, Capt. F. C. Ray (1-2); Fifth District, Norfolk, Rear Adm. Andrew G. Bissett (1), Capt. A. D. Alexis (2); Sixth District, Charleston, S. C., Capt. James D. Wilson (1), Comdr. J. C. Tilly (2); Eighth District, New Orleans, Capt. William B. Howard (1-2); Ninth District, Great Lakes, Ill., Capt. J. C. Gebhard (1), Comdr. M. Nichols (2); Tenth District, San Juan, Puerto Rico, Capt. K. A. Godwin (1-2); Eleventh District, San Diego, Calif., Capt. Charles R. Johnson (1-2); Twelfth District, San Francisco, Capt. K. B. Bragg (1), Capt. George D. Wetsel (2); Thirteenth District, Seattle, Capt. Hugo C. Fischer (1-2); Fourteenth District, Oahu, Hawaii, Capt. Carl W. Porter (1-2); Fifteenth District, Balboa, Canal Zone, Comdr. George K. Brodie (1-2); Seventeenth District, Kodiak, Alaska, Capt. R. P. Carlson (2); Potomac River Naval Command, Washington, D. C., Capt. Ed. B. Keating (1-2); Seven River Command, Annapolis, Md., Capt. H. B. Jones (2).

Appointment of Gail E. Spain to the post of director, Agricultural Machinery Branch of the Machinery Division, European Economic Administration, is the tip-off that ECA is ready to formulate a definite, workable program of loans and grants in this equipment field, which includes the tractors that are so vital to American construction. As vice-president of Caterpillar Tractor Co., Mr. Spain is a top-flight authority on both our capabilities and limitations in meeting a world-wide need for our construction and farming equipment. He has taken a 3 months' leave of absence from his job to serve ECA.

Artificial rain ordered by group to ease California water shortage

Meteorologist to keep ground moist so that winter rains will run off rather than be lost to ground water table

A parched patch of southern California near San Diego is betting $30,000 that it can milk enough rain out of the clouds to alleviate its water shortage.

The money goes to Dr. Irving P. Krick, meteorologist who had the wartime responsibility of picking the day for the Normandy invasion. A former professor at the California Institute of Technology, he now operates a private weather forecasting service in Pasadena, Calif.

Krick's aim is to produce 1 in. of rainfall over a given area — just enough to moisten the ground so that winter rains will run off and not just soak into the ground as they did last season.

He believes that the area around San Diego County is the one place in the United States where artificial production of rain by seeding clouds with dry ice will bring enough rain to be practicable. An ideal combination of conditions exist there, he points out. The nearby Gulf of California sends storm clouds over the mountains, the freezing level is constant and there are from two to six days a month during summer which are favorable for artificial production of rain.

Backing the venture are the county of San Diego, three irrigation districts, two large land owners and a resort company, all of which are in the area.

Lloyds of London is providing property damage insurance up to $500,000 for a $1,750 monthly premium while cloud seeding is in progress.

On suitable days a B-25 bomber will be dispatched from Burbank Field loaded with 1,000 lbs. of dry ice. From 70 to 100 lbs. will be sprayed into the storm centers of each cloud formation at approximately 5-mi. intervals and within 20 sq. mi. rectangles. Most of the flying will be at 25,000-ft. altitudes.

City wary of results

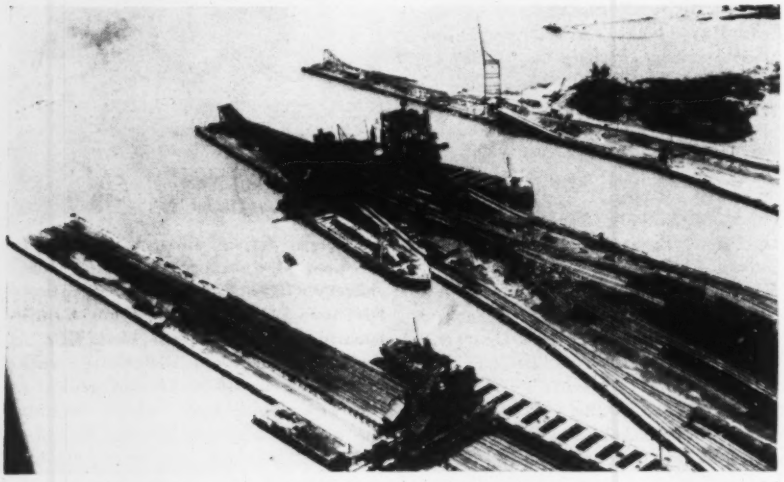
The City of San Diego, which was expected to put up the greatest single share of the money, backed off, not so much because it feared failure as because it feared too much success. Five other water agencies who helped pay for a $2,950 preliminary study by Krick of prevailing weather conditions also withdrew.

San Diego's greatest disaster was the deluge of 1916. By coincidence or otherwise, those rains followed the signing of a contract with Charles M. Hatfield — "Hatfield the Rainmaker." Only a court decision that the rains were an act of God, not of Hatfield, saved the city from paying millions in damage suits.

A recent unseasonal rain at Palm Springs which flooded the streets with 4 in. of water added to the concern of city officials.

"If we had happened to be seeding clouds that day, we certainly would have been blamed for the flood and would have had to defend damage suits," said G. E. Arnold, city water director.

The recently-completed San Diego Aqueduct has temporarily settled the water problem for much of the San Diego area. However, the area's growth will make more water necessary in from 10 to 20 years. Backers of the cloud seeding program point out it would be much cheaper to get runoff water from the clouds than add a second barrel to the aqueduct.



LAKE ERIE TERMINAL at Toledo, Ohio. Already in operation is this new $18,500,000 coal and ore transfer point of the B. & O. and New York Central railroads. Capable of handling 20,000,000 tons of coal and 4,500,000 tons of iron ore each shipping season, the three piers mount unloading machines and coal-dumpers which can remove 30 tons of ore per minute from lake vessels and unload one 70-ton hopper car per minute into the ships.

Irrigation districts ask power project license

Two California public irrigation districts — the Oakdale and the South San Joaquin — are seeking a license from the Federal Power Commission for construction of a hydroelectric project on the middle fork of the Stanislaus River in Tuolumne County, Calif. Total cost is estimated at $8,840,000.

The proposed project calls for a rockfill dam with a height of 275 ft. and a crest length of 1,150 ft., a water conduit, a power plant and switchyard immediately below the dam, and appurtenant facilities. At maximum storage level the reservoir would have a surface area of 720 acres and gross capacity of 97,500 acre-ft.

Engineers to complete dam far ahead of schedule

Dorena Dam, one of a series of 16 planned by Army Engineers to control floods in the Willamette basin of western Oregon, will be completed nine months ahead of schedule, Col. O. E. Walsh, Portland district engineer, predicted recently.

The dam, located on Row River, a tributary of the coast fork of the Willamette, is 63 percent finished and completion is now set for October, 1949, instead of July, 1950, as provided in the contract held by Guy F. Atkinson & Associates.

The $14,000,000 structure, with a crest length of 3,300 ft., will store water for flood control and increase low water flow in the Willamette. It is one of three dams in the $406,000,000 Willamette project now under construction.

All told, the project will have 16 multiple-purpose dams, and 422 miles of tributary stream channel improvement.

See $700 million Oregon road needs

Oregon's legislative interim highway committee recently received the comprehensive engineering study it had authorized, to determine what must be done on state and county roads and city streets to meet the minimum requirements of the next ten years.

The engineers' report to the committee listed construction needs, both immediate and for ten years, totaling $704,983,000, distributed thusly: State highways, $468,839,000; county roads, $156,251,000; city streets, $78,893,000. Of the total, $261,327,000 is needed for immediate construction on all systems, the report stated.

Cost of improvement of the federal-aid systems in Oregon, which overlap the state, county and city systems included in the overall total, is $488,887,500, the engineering study found.

Annual cost of improving all systems—with allowance for stopgap improvements in the longer programs—would be: 10-year program, $83,418,000; 15-year, $63,286,000; 20-year, $54,609,000.

Third such study

Oregon's is the third state highway engineering study that the Automotive Safety Foundation has been invited to direct. A similar report on a study for the state of Washington will be ready about October 1. Studies have been completed for California and Michigan, and the California legislature has accepted the report for that state.

Carl E. Fritts is supervising engineer heading up the Oregon and Washington studies. In direct charge of the Oregon investigation is Bob (OK) Glenn, professor of highway engineering on temporary leave from Oregon State College.

Among the conclusions of the engineering report: No more mileage should be added to the state highway system unless such mileage is of predominantly state interest; about 1,300 miles of present state secondary roads of county primary or local character should be returned to the counties; county roads should be classified into two systems—county primary and local roads—and the county primary system should be limited to 4,300 miles.

Also: City streets should be classified in two systems—arterial and local streets—and the arterial systems should be limited to 660 miles, approved by the highway commission, and the total of arterial street mileage should not exceed 20 percent of the total street mileage of all cities.

Revised plans filed for Chesapeake Bay span

Revised plans for the proposed Chesapeake Bay bridge, providing for artificial islands for anchor piers of the suspension plan and other changes, have been filed with the district engineer at Baltimore.

The proposed revisions include:

Establishment of stone-protected embankments at the anchor piers and backstays of the suspension unit over the main channel.

Realignment of the western approach to the main span.

A revision of the grade from the main span to the east from 2 percent to 1.9 per cent.

An increase in length of the through cantilever truss unit over the easterly secondary channel by the addition of two panels to each of the anchor arms with no change in the main span of the unit.

Substitution of open bridge construction for fill causeway at the western approach.

The last mentioned change may tend to nullify the opposition to the bridge which has arisen in Virginia and Maryland on the ground that it might cause accumulation of ice floes sufficient to interfere with winter water traffic to Baltimore. A protest by the International Longshoremen's Assn. (AFL) recommends that a tunnel be constructed or high-speed ferries authorized. Some fish, oyster and crab industry interests are also opposing the bridge.

Wide World Photo

GOOD ROADS DAY in Temple, N. H., has been observed on the last Saturday in August for the last 35 years. Volunteers of all ages lend time and energy to repair of roads not regularly scheduled for attention of township facilities.

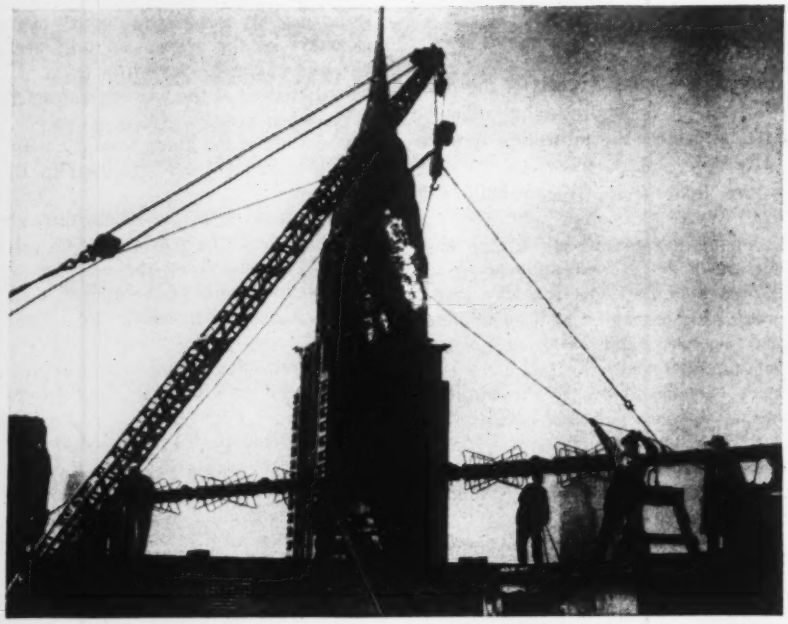
New York announces $23 million highway work

Some 22 highway projects in New York state, involving 82.37 miles of construction and estimated to cost $22,668,000, were announced recently. According to retiring Superintendent of Public Works Charles H. Sells, the Sept. 29 bid opening will be one of the largest postwar bid openings in the state.

Included is a railroad grade crossing elimination project in Nassau County estimated to cost $5,067,000. Another similar project at Ballston in Saratoga County is estimated at $2,577,000. Superhighway work includes a $4,437,000 viaduct superstructure on the Bronx-Queens Expressway and surfacing on the Ontario County Thruway estimated at $1,003,000.

Pennsylvania Turnpike extension bids due

First construction bids on the 100-mile extension of the Pennsylvania Turnpike are scheduled to be opened by the Turnpike Commission on Sept. 22. This is the first of 80 separate contracts to be let within the next year for about $80,000,000 worth of work that will extend the Turnpike from its terminus west of Harrisburg to Philadelphia.



TELEVISION ANTENNA—Transmission of television programs from WPIX in the Daily News Building in New York City required raising this "bat-winged" antenna 467 ft. from street level to the roof.

Television station built from roof up

Working 37 stories above the street, as did the Turner Construction Co. in finishing television station WPIX studios in the News Building recently, can present a tough problem of materials handling.

The New York construction firm "suspended" a two-story studio on a nine-story wing of the building and raised transmitting apparatus 280 ft. above the 37th floor.

Problems encountered in the work, engineered by Alexander D. Crossett and Associates of New York, included: hoisting 65 tons of structural steel up the outside of the building; bringing 150 cu. yd. of concrete to the work via a 5-ft. by 6-ft. service elevator; getting form lumber, plumbing and steam fitting pipe and lathers' furring channels of sufficient quantity and in lengths not exceeding 10 ft. by the same service elevator. This entire problem of supplying materials to the job had to be handled without disturbing passenger elevator service.

A small, collapsible derrick with a 40-ft. boom was brought to the roof by the service elevator. With this, the larger hoisting equipment, a stiff-legged derrick with a 60-ft. boom, was raised from the street. This larger derrick then brought the antenna and structural steel from below.

The 37th floor was built within existing walls which extended 40 ft. above the 36th floor meteorological station. Then the transmission tower was erected on the roof of the newly added story.

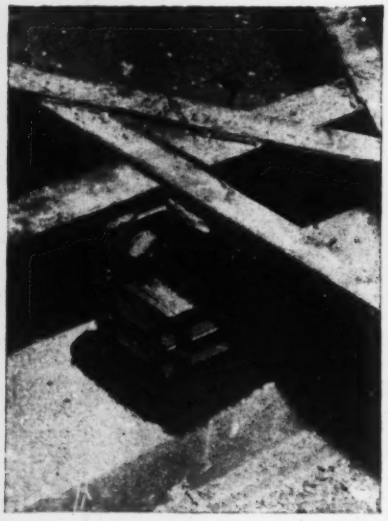
Suspended studio added

Largest room in the 10th and 11th floor addition is the television studio which is suspended within an outer shell. Floor supports are laid on "isolators" of steel and rubber and the ceiling is hung from springs in an effort to avoid any transmission of the vibrations of presses and other machinery in the building.

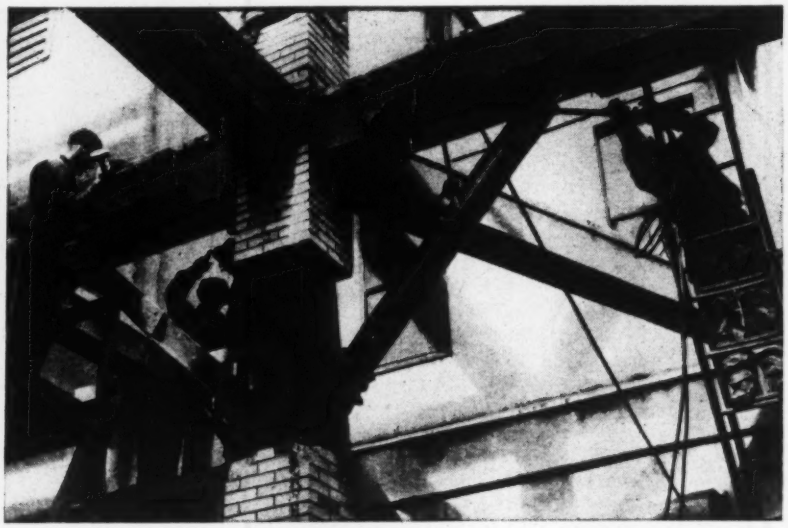
The studio is provided with a sponsor gallery and a control room at second floor level, separated from the studio by glass panels.

A smaller news studio is adjacent to the main studio and is also acoustically insulated.

The 10th and 11th floor areas include, in addition to studios, a transcription library, recording room, projection room, master control room, rewind room, dressing, toilet and coat rooms.



FLOOR ISOLATORS — "Sandwiches" of steel, felt and rubber support the studio floor while combatting transmission of vibration from newspaper presses on floors below.



NEW KNEE BRACES REQUIRED—Existing knee braces were removed and shorter ones used to provide clearance for roof steel on the new 37th floor. Worker at left chips away fireproofing while man on the ladder cuts knee brace away from roof beam. Columns were later reinforced to enable them to carry safely the added transmission tower loads.

Equitable draft plan promised to NSPE

Indiscriminate drafting of engineers and scientists, as was practiced during World War II, would be avoided in any future draft through introduction of a more equitable system, Selective Service Director Lewis B. Hershey said in a recent letter to the National Society of Professional Engineers.

General Hershey's letter, addressed to Paul Robbins, the society's executive director, stated the selective service system aim would be to place each individual so as "to serve best the national interest."

NSPE, both at hearings before the House and Senate Armed Services Committee during the writing of existing draft laws and in representations to Hershey, had asked that an equitable system of drafting engineering personnel be established.

Similar representations were made to the Selective Service Director by the Engineers Joint Council through its Committee on Selective Service Legislation.

Place early order for Hungry Horse equipment

To assure prompt delivery, the Reclamation Bureau has already ordered transformers for its huge Hungry Horse project in Montana, even before Congress has appropriated the funds for this equipment. The dam construction contract was awarded only four months ago (*ENR*, April 29, Vol. p. 618).

This order emphasizes in large figures the time needed on today's backlogs to get delivery of electrical equipment for power plants.

Principal contract for construction of Hungry Horse Dam, located on the south fork of the Flathead River, near Kalispell, Mont., was let last April. The 286,000-kw. hydro generating plant will be completed in the period 1952-54, according to present plans.

Break ground for Oahe, third Missouri basin dam

Oahe dam, third project of the Pick-Sloan Plan for developments of the Missouri River basin, went under construction by the Corps of Engineers following ground breaking ceremonies Sept. 16.

Located on the Missouri River six miles northwest of Pierre, S. D., the rolled earth-fill structure will require placing of 78,000,000 cu.yd. of material, have a crest length of 9,300 ft. and stand 230 ft. high.

PERSPECTIVE . . . .

Streamlining the federal government

The report of the Hoover Commission, due next January, may well effect the Corps of Engineers, Bureau of Reclamation, Public Roads Administration and other agencies.

For more than a year this commission on the organization of the executive branch has been working. What it finally recommends to Congress in January will be of urgent importance to the next President.

There have been a half dozen attempts in the past at reorganization of the sprawling federal bureaucracy. The first was during the William Howard Taft administration. Inquiries were held in the Harding, Hoover and Roosevelt administrations as well. But none went beyond the question of how to improve administrative efficiency.

The Hoover Commission is proceeding along what it calls functional lines, though there's sentiment in the commission opposed to going beyond the scope of efficiency and economy.

However, ex-President Hoover, the chairman, wields a dominating influence. The decisions made thus far have been, by and large, his own. He regards the commission as his last public service, and he intends to take full advantage of the broad language in the act setting up the commission.

Besides Hoover, on the balanced bipartisan commission are Dean Acheson, former undersecretary of state; Arthur Flemming, until last month chairman of the Civil Service Commission; Defense Secretary Forrestal; George H. Mead, Pennsylvania paper manufacturer; Sen. Aiken of Vermont and Sen. McClellan of Arkansas; ex-Ambassador Joseph P. Kennedy; James K. Pollack of the University of Michigan; Rep. Clarence Brown of Ohio and Rep. Carter Manasco of Alabama, and James H. Rowe, Jr., former assistant attorney general.

Touchstone of the commission project is the federal budget. Spending that now is running at the rate of just under $40-billions annually will progressively increase—under present authorizations—to close to $50 billions in 1951.

Of that, approximately 80 per cent can be charged up to national defense, foreign policy programs (ECA and the like); veterans affairs and servicing of the debt.

Thus, the commission runs into the same knotty problem the Republican Congress found when it tried to fulfill its economy pledge. You've got to do your hatchet work on a mere 20 per cent of the federal budget—personnel, grants-in-aid programs, agriculture benefits, etc.

Research and other spade work has been handed over by the commission to 23 committees, called "task forces." These are composed of professional experts and well-known public figures, like Robert Moses, outstanding municipal planner of New York, who is doing the investigation of public works.

The work of the task forces will be completed by mid-November. Until then the commission won't be able to do much final writing of a report. Much of the research will dovetail into other studies; in some instances there will be conflicts between two or three groups that will have to be resolved.

In any event, the commission will have the last say, despite the recommendations of Moses, or any other committee head. Here are a few preliminary recommendations the researchers are considering:

Public Works: Moses has written a report recommending creation of a department of public works in the cabinet. It would swallow up the Army Corps of Engineers civilian functions, the Bureau of Reclamation, and so forth. Moses would also put the Public Roads and Public Buildings administrations in the department of public works.

The task force on natural resources, dominated by westeners, is considering a proposal to establish a natural resources agency with authority over all but the rate-making powers of the Federal Power Commission.

Transportation: Stray support is anticipated for a proposal that a transportation agency be created to run air, land and sea transportation.

What Congress does with the commission's findings is another matter. It registered its substantial interest in the project by coming through with adequate funds to finance the operation. But, many Congressmen already have doubts about the success of their own Reorganization Act, passed in 1946; and their progress in putting any of the Hoover findings into effect may go slowly.

Tallamy succeeds Sells as head of N. Y. Pub. Works

Bertram D. Tallamy, 46, of Buffalo, on Sept. 2, was appointed superintendent of public works for New York State to succeed Charles H. Sells who resigned, effective Sept. 30, to return to private business as a consulting engineer.

Mr. Tallamy, who was chief engineer and former deputy superintendent, was graduated from Rensselaer Polytechnic Institute in 1925. He began his engineering work in western New York. In 1930 with W. F. Sheehan and W.V.R. Fretts he organized an engineering firm, which in 1940 became Fretts, Tallamy, Senior and Forrestel. Retained by the Federal Public Housing Authority, this firm designed and supervised the construction of a 1,050-unit housing project near Buffalo.

Mr. Tallamy became chief engineer of the Niagara Frontier Planning Board, but resigned in 1945 to become deputy superintendent, in which office he was responsible for the formulation of the state's $840,000,000 postwar program of public works and reconstruction, including rehabilitation of the highway system, planning the Thruway system and the urban arterial route program, extension of parkways, grade crossing elimination, and Barge Canal improvements. He became chief engineer on July 1, 1947.

Mr. Sells was appointed superintendent on May 20, 1943. He had previously been Commissioner of Public Works for Westchester County, and later spent 13 months in Iran directing a $16,000,000 lend-lease construction program. During the war, he also surveyed airport projects in Brazil for the U. S. government. He received his engineering degree from the University of Colorado in 1914.

CAA offers 50 new grants totalling near $6 million

Fifty grant offers of federal money for as many airport projects were made during the month ended Aug. 15 by the Civil Aeronautics Administration, Delos W. Rentzel, administrator of civil aeronautics, announced last week.

These grants bring the total of projects under way to 439. Grant offers for the month amounted to $5,974,198.

Of the 439 projects, 125 are on class 1 airports; 110 on class 2; 114 on class 3; and 90 on class 4 and larger.

The largest project offered federal money in the month was the airport at San Francisco, where $2,352,606 will be matched by $1,998,432 of local funds.

Bridge-tunnel crossing approved for Norfolk

The proposed $20,000,000 highway bridge-tunnel crossing connecting Norfolk with Berkeley and Portsmouth, Va., was a step nearer actuality recently on the granting of a permit for the work by the chief of Army Engineers. Detailed plans are now being drawn up to provide a four-lane bridge crossing of the Elizabeth River, eastern branch, between Norfolk and Berkeley, and a connecting two-lane tube under the southern branch to Portsmouth.

Details of the revenue bond financing have not yet been arranged by the Elizabeth River Tunnel Commission. Yet to be settled, are the terms of an annual payment of some $120,000 by the city of Norfolk to the commission to compensate for the competition of toll-free bridges now existing between Norfolk and Berkeley.

MAJOR MEETINGS

Engineer and Architects Association, Hollywood Roosevelt Hotel, Los Angeles, Calif., Sept. 24-26.

Producers' Council, annual meeting, Hotel Commodore, New York City, Sept. 29-Oct. 1.

American Institute of Steel Construction, annual convention, Chateau Frontenac, Quebec, Can., Oct. 4-7.

Concrete Reinforcing Steel Institute, semi-annual meeting, Grove Park Inn, Asheville, N. C., Oct. 5-9.

American Society of Photogrammetry, semi-annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., Oct. 7-8.

Seabee Veterans of America, First national convention, La Salle Hotel, Chicago, Ill., Oct. 8-10.

American Society of Planning Officials, national planning conference, New Yorker Hotel, New York City, Oct. 11-13.

Institute of Traffic Engineers, annual meeting, Hotel Warwick, Philadelphia, Pa., Oct. 11-13.

American Society of Civil Engineers, fall meeting, Statler Hotel, Boston, Mass., Oct. 13-15.

American Public Works Association, public works congress and equipment show, Copley Plaza Hotel, Boston, Oct. 17-20.

Federation of Sewage Works Associations, with annual meeting **Michigan Sewage Works Association,** Hotel Statler, Detroit, Mich., Oct. 18-21.

National Safety Congress, Stevens Hotel, Chicago, Ill., Oct. 18-22.

Joint Meeting Four States and Western Pa. sections of A.W.W.A., Penn Sheraton Hotel, Philadelphia, Pa., Oct. 20.

Structural Engineers' Assn. of California, annual convention, Biltmore Hotel, Santa Barbara, Calif., Oct. 21-24.

American Welding Society, annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. Week of Oct. 24.

Harry H. Barber dies, pioneer equipment maker

Harry H. Barber, 70, chairman of the board of the Barber-Greene Co., Aurora, Ill., manufacturers of bituminous road building equipment and machinery for handling materials, died Sept. 6.

One of the pioneer designers of construction equipment, in 1945 he retired as president of his company to become chairman of the board.

After being graduated at the University of Illinois in 1907, Mr. Barber was employed by the Stephens-Adamson Mfg. Co. of Aurora. In 1916 he formed a partnership with William B. Greene. The first Barber-Greene machine, a portable belt conveyor, was followed by the self-feeding bucket loader in 1917, which in turn became a semi-crawler machine in 1919 and a full crawler mounted unit in 1920. Experiments on the vertical boom ditcher were started in 1920, and production began in 1924. In 1920 the first snow loading machine was built.

Barber's developments were all new conceptions rather than improvements on older machines of the same type. Probably the most important application of his creations was in the late war.

Low salary levels hinder North Carolina road work

A delegation from the North Carolina Highway Commission conferred with Governor Gregg Cherry Aug. 31 to request salary raises for its fixed salary workers and was assured that the governor would look into the matter.

The conference was scheduled at the request of Chairman A. H. Graham of the highway commission, whose department officials had told him they were losing many of their experienced engineers and other workers to jobs with higher pay.

At a recent meeting of the commission W. H. Rogers, Jr., Graham's administrative assistant, reported that the State Budget Bureau had failed to act on 302 requests for routine pay increases submitted since June 1, and that low salary levels made it impossible for the commission to get new employees or to keep old ones.

The commission, before appointing the committee to call on the governor, said that the policies of Budget Bureau Director R. G. Deyton had impaired employee morale, driven skilled technicians to other jobs, and forced workers to face the rising cost of living without hope of a raise.

OBITUARY

Clarence J. Kennedy, 62, plant engineer, American Bridge Co., Gary, Ind., for the last 18 years, died Aug. 11 in that city. A graduate from Highland Park College, Des Moines, Iowa, in 1909, Mr. Kennedy spent 37 years with the American Bridge Co., advancing progressively through various responsible positions to that of plant engineer at the Gary Plant in 1930, which position he held at the time of his death.

Capt. Frank M. Stuart, 61, retired Army reserve officer and evaluation engineer with the Interstate Commerce Commission, died Aug. 31 at Washington, D. C. A native of Aurora, Ill., Captain Stuart attended Rose Polytechnic Institute and was a civil engineering graduate from Highland Park College, Des Moines, Iowa. He was a construction engineer with the Union Pacific Railroad for eight years before World War I and during the war was a captain in the 22nd Engineers. He remained a reserve Army officer during his service in the government. Captain Stuart had been with ICC's Bureau of Valuation for more than 20 years when he retired last February.

A. W. Malone, 64, construction engineer of Sanderson & Porter, a New York firm, died at Monongahela, Pa., Sept. 5. He had been supervising construction of a multi-million dollar power plant for the West Penn Power Co. at Courtney, Pa. During his career he was engaged in construction projects throughout the world. In the first world war he was a captain with the 32d Engineers and served overseas.

Howard T. Harper, 26, civil engineer for the New York Central Railroad, died Aug. 25 at Greensburg, Ind., following an automobile accident. He was a graduate of Ohio State University.

Grant A. Adams, 80, building contractor, who helped to build the Lincoln Memorial in Washington, D. C., died recently in Pomona, Calif.

Edward Massey, president of the Massey Construction Co., Wallaceburg, Ont., was killed Sept. 2 in a plane crash.

George W. Philips, 71, a former bridge engineer for the Pennsylvania State Highways Department for 21 years, died Sept. 7 at Wayne, Pa. He formerly had been a resident engineer on the Hell Gate Bridge, New York, and at one time operated his own contracting business.

Thomas Rainier, 76, an engineer for the Burlington, N. J., water works died recently.

Henry Wolf, 57, a civil engineer for 33 years, died at Philadelphia, Pa., on Sept. 2. He was a graduate of the University of Pennsylvania and a member of the firm of Wolf and McLaughlin.

Stuart B. Over, a civil engineer, died Sept. 1 at Wayne, Pa. For 25 years he headed the firm of Over and Tingley, engineers and surveyors, Brookline, Pa.

Charles L. Hill, 56, former Reno, Nev., city engineer, died Aug. 27 in that city. For the last nine years he had been secretary-manager of the Nevada chapter of AGC. He worked on highway and irrigation projects in Oregon and Nevada, serving as division engineer for the Nevada State Highway Department before taking the Reno post in 1935.

Ivor Kriken, 63, project manager for Drake-Pugent Sound on a naval construction contract at Attu, Alaska, died Sept. 2 at Seattle, Wash. He had been construction superintendent for the company since 1939, with the exception of two years on a CAA airfield at Nome, Alaska.

J. Lorn Allan, 70, died at Dartmouth, N. S., Sept. 2. He was graduated in civil engineering at the University of Toronto. He settled at Dartmouth 40 years ago and set up a practice as a consulting engineer, covering Nova Scotia. He had also been town engineer of Dartmouth.

Anthony J. Gauckler, 50, a structural engineer for the school board of Milwaukee, Wis., until his retirement in 1940, died Sept. 3. He received his civil engineering degree from Marquette University in 1920.

Frank M. O'Donnell, 59, an engineer and chief of the Rhode Island division of rivers and harbors since 1938, and vice-president of the state planning board for eleven years until 1947, died at Woonsocket, R. I., Sept. 8. Recently he had served as technical adviser to the Blackstone Sewer District Commission and formerly was superintendent of construction of the Easton Construction Co. of New York.

CONSTRUCTION ACTIVITY

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of Sept. 16 1948	Cumulative 1948 (38 wks.)	Cumulative 1947 (38 wks.)
Federal	$12,781	$716,451	$484,838
State & Mun.	66,050	1,913,432	1,249,173
Total Public.	$78,831	$2,629,883	$1,734,011
Total Private	104,449	2,414,472	2,237,208
U. S. Total..	**$183,280**	**$5,044,355**	**$3,971,219**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

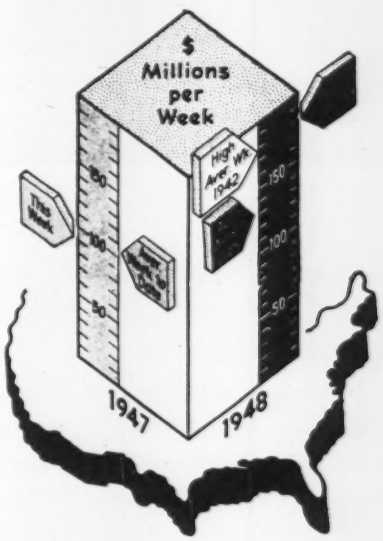
Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1948 (38 wks.)	Cumulative 1947 (38 wks.)
Waterworks ...	$12,615	$158,284	$80,096
Sewerage	3,401	161,918	98,625
Bridges	1,953	208,039	125,048
Highways	20,826	760,886	595,811
Earthwork, Waterways	12,214	379,464	225,838
Buildings, Public	25,305	790,925	415,485
Industrial ...	16,378	702,976	610,921
Commercial .	79,629	1,393,205	1,306,982
Unclassified ...	10,959	488,658	512,413

NOTE: Minimum size projects included are: Waterworks and waterways projects, $28,000; other public works, $50,000; industrial buildings, $68,000; other buildings, $250,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1948 (38 wks.)	Cumulative 1947 (38 wks.)
NON-FEDERAL	$3,459,433	$1,651,116
Corporate Securities	1,688,857	594,742
State and Municipal	1,278,287	808,663
U. N. Building Loan	65,000	.....
Fed. Aid Highway.	427,289	247,711
FEDERAL	1,558,932	818,729
Total Capital	**$5,018,365**	**$2,469,845**



As Reported this week to ... *Engineering News-Record*

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost..	Sept. '48	476.80	229.20
Building Cost	Sept. '48	356.70	192.82
Volume	Aug. '48	254	111

EDITORIALS

VOLUME 141 NUMBER 12

September 16, 1948

Paving With Prestressed Concrete

NEW PROBLEMS in airport runway and apron design are foreshadowed by the introduction of heavier planes. The experimental use of a prestressed slab at Orly Field, France (p. 104) therefore represents a significant development as well as a new application of this relatively little practiced method of concrete construction. The American answer to the problem of heavier planes has been a thicker slab—as much as 21 in. in several cases. Freyssinet, the French pioneer in prestressed concrete, regards this not only as a waste of material, but as an ineffective design that will crack and deteriorate. His Orly slab is only 6 in. thick and is claimed to be undamaged by cracks, since the prestressing converts the concrete into an elastic material. Cracks are impossible until the prestress is overcome and then, if they do occur, they will close when the load is removed. Until recently the use of prestressed concrete in the U. S. has not extended beyond tanks and pipe where, plainly, cracklessness is of prime importance. Interestingly enough, however, our latest prestressed construction has involved a warehouse floor slab in Chicago in which the John A. Roebling's Sons Co., has experimented with the use of wire cables as the prestressing mechanism. A definite objective of this installation was to examine its adaptability to airport paving. For this type of service—or even for high-capacity highway slabs—prestressing is a process that should not be overlooked.

Big Pumping Plants

ONE OF THE most important but not always the most immediately spectacular element of many new irrigation projects is the huge pumping installation for getting water to the land. Both in capacity and lift the design of these pumping plants stirs the imagination. For example, the Granby pumping plant for the Colorado Big-Thompson project, described in this issue, contains three 200 cfs. pumps that will lift water 186 feet. This is a big installation, but it is far overshadowed by two other plants now just getting started. On the Central Valley project in California the Delta-Mendota pumping plant will include six units with a total capacity of 4,500 cfs. and a lift of some 200 ft. And biggest of all will be at Grand Coulee where ten units with a total capacity of 16,000 cfs. will lift water for an average of 310 ft. Prior to the design of the high-lift, high-capacity pumps for the Metropolitan Water District of Southern California in the middle Thirties (200 sec. ft. units with head up to 444 ft.) there was relatively little experience as a guide for the selection of such huge units. The projects now under way, therefore, are providing pump designers an unusually challenging opportunity.

Salute to the Public Health Service

THE 150TH ANNIVERSARY of the U. S. Public Health Service, which occurred this summer, is one that engineers can hail with much enthusiasm. From its modest beginning in 1798 as the Marine Hospital Service "for the relief of sick and disabled seamen," it has grown mightily in stature, and today assumes major national responsibility for protecting and advancing the health of all citizens of the United States. In carrying out this role, engineers hold important assignments as members of its sanitary engineering division. Their task of applying engineering skills to the solutions of public-health problems grows even more challenging as, for example, in the development of environmental control methods for nuclear fission liquids, gases and solids. In this, and in the more traditional fields of endeavor related to stream sanitation, ventilation, rodent control, and food handling, engineers of the USPHS are finding wide scope and satisfaction-producing opportunities for the utilization of their talents. It is with more than academic interest, therefore, that engineers salute the USPHS on an anniversary that marks a century and a half of rich achievement.

Heating Systems Compared

USING RADIANT ENERGY, as the sun does in warming the earth, the heating system described on p. 101 maintained comfort conditions in a hangar without requiring higher inside air temperatures than 50 or 60 deg. Many authorities refer to this installation as panel heating rather than radiant heating, because some energy is absorbed by the air and heats the hangar by convection. However, this energy is a relatively small portion of the total, otherwise temperatures would have

been higher. Other types of heating systems—conventional steam and hot water, for example—also utilize both convection and radiation, but here the greater percentage of the energy is distributed by convection. Thus, the difference between the methods of heating is measured by the extent to which convection and radiation are used.

If the systems in which radiation predominates are considered radiant heating, then there are three main types: point heating (old-fashioned pot-bellied stove); line heating (baseboard); and panel. These may be further subdivided into several classifications, according to the heating medium used. In the case of panel heating, for example, heat may be distributed by warm water flowing through pipes embedded in walls, floor or ceiling or by electric current passing through wires in similar locations.

Regardless of classification, however, the principles of radiant heating are well established and the method now is far beyond the experimental stage. Its particular importance to engineers and contractors is that it requires more definite structural accommodation than do the other types of heating systems.

Construction Camp Coffee

A FAVORITE STORY of F. H. Cothran, whose passing was reported in the Sept. 9 issue, concerned the complaint of his superintendent over the poor coffee in the new mess hall at the Beauharnois power project. Mr. Cothran was particularly puzzled, because he had bought an unusually high grade of coffee to serve. But deferring to the complaint, he tried another and then a third high-grade brand. These proved no more acceptable and then, realizing that the superintendent had spent most of his active career in construction camps, Mr. Cothran told the cook to buy a poor grade of coffee, one that was mostly chicory, and brew the super a strong pot of that. "There," said the super, as he sampled the new brand under Mr. Cothran's watchful eye, "is a real cup of coffee."

Behind this trivial incident lies a lesson that is frequently overlooked. Frank Cothran was a master of construction-job organization and management. He knew how to visualize a great construction operation and to plan to cut unit costs to a minimum through the application of the right type of equipment to each element of the job. But his skill went beyond that; he recognized that the most efficient equipment is of little use if the men hired to run it are discontented or restive. The coffee incident is typical of his capacity for infinite detail when it came to questions of personnel.

Too many jobs fail to come up to the potentialities of the equipment on them through failure to recognize that construction is teamwork—men and machines—and that in the end the men are vastly more important.

Construction Prospects

THE BREAK in lumber prices reported last week is the best possible news for the construction industry whose prosperity and prospects are so shakily enthroned at a high cost level. Softening in material prices would be a welcome antidote to several other recent developments: insurance company postponement of their large housing programs until a more favorable ratio of costs to permissible rents is possible; abandonment of building plans by several large industrial companies; and the growing attitude, particularly in the fields of local public works and of small private construction, to take a dim view of starting jobs at present cost levels.

The paradox of the present situation is that, except in the realm of costs, construction prospects are bolstered by uniformly good signs. Engineered construction, at the present rate of contract awards, is headed for a $7 billion year, the highest peace year and second only to the $8 billion war year in 1942. Total construction, including jobs of every type and size, will add up to $15 billions for 1948. What is more significant, since it presages continuing activity, is the mounting volume of capital being made available for new work. At the present time these new capital figures are 107 percent above last year.

Given a break on costs, therefore, there is good reason to expect that the demand for the services of engineers and contractors, which is unquestionably great, can be converted into a continued high volume of activity. However, without some cost relief, there is trouble ahead.

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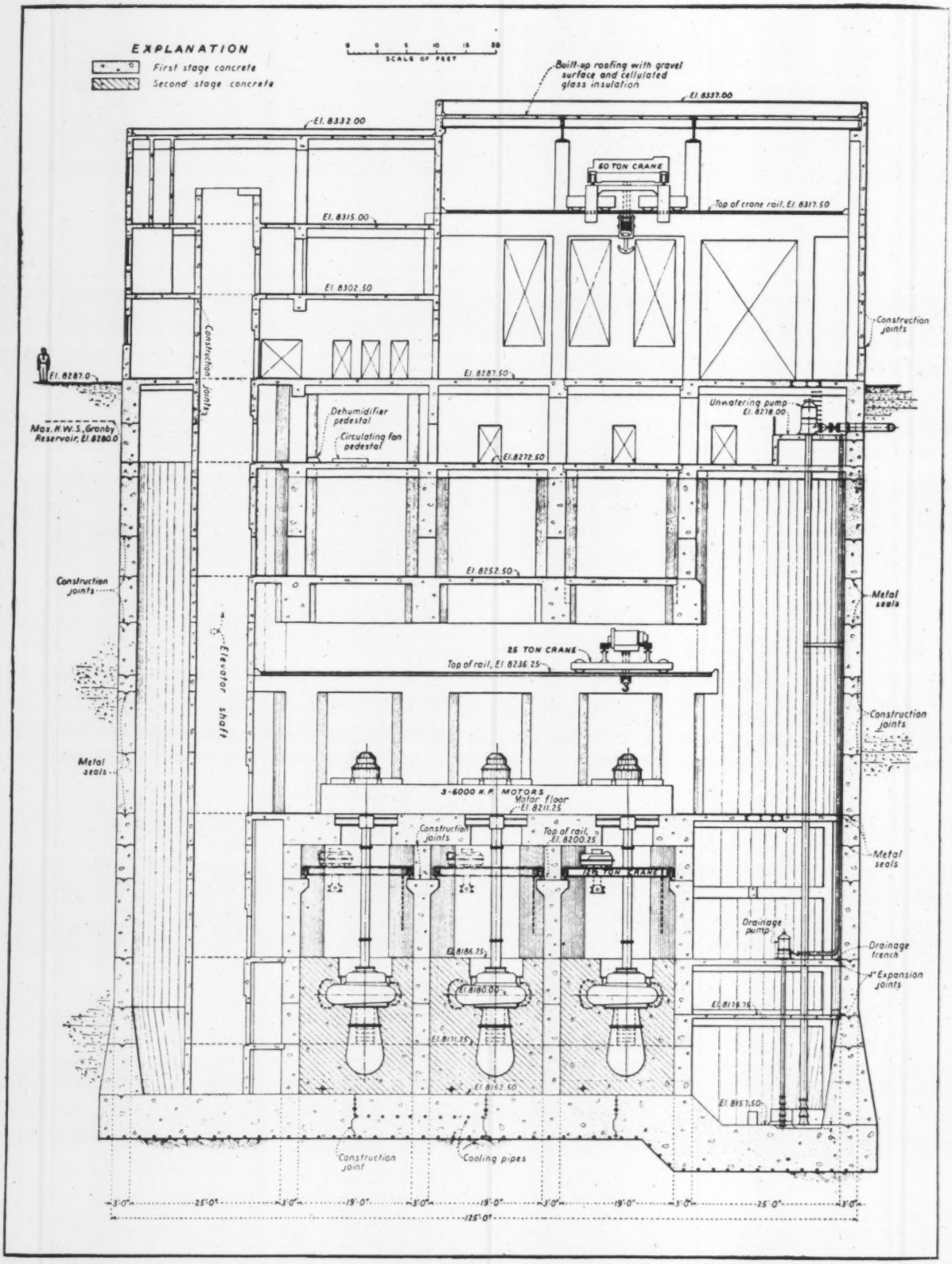

FIG. 1. AS HIGH AS A 13-STORY OFFICE BUILDING, the Granby reinforced-concrete pumping plant structure is characterized by a complex system of framing consisting of a monolithic combination of arch rings, cross walls and buttresses.

Colorado-Big Thompson Pumping Plant

Lifting stored west-slope water 186 ft. for diversion through the Rocky Mountains calls for a deep pump house to resist unusual earth and water loads as well as a special intake structure and discharge canal, all of which are now under construction.

Richard J. Willson
Field Engineer, U. S. Bureau of Reclamation
Grand Lake, Colo.

DIVERSION of 310,000 acre ft. of water annually from the western slope to the eastern side of the Continental Divide through the 13-mi. Alva B. Adams tunnel of the Colorado-Big Thompson project, is largely dependent upon construction of the Granby pumping plant and its appurtenant works (*ENR* Dec. 11, 1947 vol. p. 792). Details of the design and progress being made on the construction of these facilities is the subject of this article.

By way of introduction, it should be pointed out that the plant is located on the north shore of Granby Reservoir on the bank of Soda Creek, a small, deeply-eroded stream that flows into the reservoir. The location provides a suitable foundation for all structures, and is the nearest economically suitable site to the Shadow Mountain Reservoir.

Function of the pumping plant in the project scheme is to lift water a maximum of 186 ft. from the 550,000 acre-ft. Granby storage reservoir to the Granby pump canal. Gravity flow to the eastern slope starts with this 1.9 mi. canal, which terminates in Shadow Mountain Reservoir. From this reservoir, water flows into Grand Lake, thence, via the Adams tunnel, through the Rocky Mountains to the eastern slope.

Work under construction

Principal structure is the 187.5-ft. reinforced-concrete housing for three double-volute, vertical-shaft pumps powered by 6,000-hp. motors. Each pump is capable of delivering 200 cfs. under the maximum operating head of 186 ft.

In addition to the pump housing, work is under way on construction of: An intake structure, located in Soda Creek; three 7.25-ft. reinforced-concrete intake conduits, leading to the plant from the intake structure; three concrete-encased, 87-in. dia. steel discharge pipes, leading from the plant through a common concrete-encased steel wye to the 11-ft. dia., 3,500-ft. long, reinforced-concrete discharge conduit; the discharge conduit; the 1.9-mi. pump canal; and electrical switchyard; and the Soda Creek diversion dike and channel.

With the exception of the pump canal, which is being constructed for the Bureau of Reclamation by the Vinnell Company of Alhambra, Calif., all other work now under way is under contract with the Granby Constructors. Total cost of all features is $7,000,000, not including the installed equipment.

Granby Constructors began work April 1, 1947, and the contract-completion date is Nov. 14, 1949. About one-quarter of the work is finished.

Canal construction, begun by the Vinnell Company on May 18, 1947, and scheduled for completion in July, is now about 65 percent complete.

A principal item of work under contract is the excavation of 520,000 cu. yd. for the pumping plant, Soda Creek dike, and other appurtenances. Some 470,000 cu. yd. of backfill and sluiced fill must be placed and about 33,000 cu. yd. of concrete will be used in the construction of the plant, intake structure, conduits and other features. The 836,000 cu. yd. of excavation is the principal item of work in the canal contract.

DESIGN FEATURES

The semicircular reinforced-concrete intake structure is located in the streambed of Soda Creek, 518 ft. from the pump plant. It is 41.0 ft. high above a 4-ft. thick base slab. The solid concrete deck on top is submerged 69 ft. below the maximum water surface (El. 8,280) in the reservoir. It was necessary to locate the intake structure at this depth to compensate for the seasonal variations in water levels at Granby Reservoir.

Some 1,400 cu. yd. of concrete will be placed in the base slab, the elliptical-shaped columns supporting the top slab and trash bars, the top slab, and the heavy 10.75-ft. thick north or back wall which adjoins and provides a transition entry to the intake conduits.

The north wall is grooved in front of the transitions to accommodate 7.25 by 9.50-ft. bulkhead gates for dewatering the intake conduits, should this be necessary. To improve flow conditions in the vicinity of the intake structure, a channel has been extended several hundred feet down the Soda Creek streambed from the intake structure. It will have a bottom width of 25 ft. and side slopes of 3 to 1.

Three circular reinforced-concrete conduits connect the intake structure with the pumping plant. These are each 7.25 ft. in dia., and 518 ft. long. The shell thickness is 18 in. for a distance of 256 ft. from the intake structure and 27 in. thick for the remaining distance to the pumping plant. The larger shell thickness is to accommodate the increased depth of backfill, which becomes greatest adjacent to the pumping plant.

The conduits are level throughout their length, except for a 9.25-ft. drop immediately adjacent to the plant. A double mat or cage of reinforcement surrounds the conduit throughout its length.

Pumping-plant structure

Equivalent in height to a 13-story office building, the pumping plant is a heavily reinforced concrete structure 187.5 ft. high. It is necessary to

resist the unusual earth and water loads with a complex system of framing, consisting of a monolithic combination of arch rings, crosswalls, and buttresses. Further care is being taken in the design to secure a watertight structure and means are being employed to reduce concrete shrinkage as is discussed later.

In elevation, the plant consists of three structural divisions: a base slab or substructure, the intermediate structure, and the superstructure.

In plan, the base slab and intermediate structure of the plant may be considered to consist of a central section 60 ft. wide and 70 ft. long, to which has been added on each end, two semi-circular arch rings having a radius of 28 ft. Above the intermediate structure, and resting upon it, the superstructure will be built in rectangular form, 60 by 125 ft. and 50 ft. high.

The foundation slab consists of an 8 to 9-ft. thickness of concrete, heavily reinforced. To reduce shrinkage of the massive block involving 3,100 cu. yd. of concrete, the base was divided into eight individual blocks and placement of concrete was arranged in a sequence of alternate blocks. As a further precaution, artificial cooling of the fresh concrete was provided by circulating cool water through a double row of coils in each block, thus removing a portion of the initial heat generated.

As shown in Fig. 1, a system of metal seals and asphalt seals were provided between the various blocks to eliminate possible leakage through the construction joints. The east portion of the base slab is 5 ft. lower in elevation and will function as a drainage sump for collection and removal of any water leaking into the plant.

The intermediate structure includes that portion above the base slab and below the ground level (El. 8,287.50). The pumps will be located in the central portion of the intermediate structure, which will also house pump motors, 88-in. butterfly-type intake valves, 76-in. butterfly-type pump discharge valves, the 12½-ton traveling crane, and the 25-ton traveling crane.

The central section of the plant may be considered to include six floors: (1) access level to the intake valves at El. 8,162.50; (2) access level to the discharge valves at El. 8,171.25; (3) the pump floor, El. 8,186.25; (4) the motor floor, El. 8,211.25; (5) general storage, El. 8,252.50; and (6) the miscellaneous equipment, storage tanks, etc. on the floor at El. 8,272.50.

FIG. 2. LOCATION of Granby pumping plant and other elements of the project on the west slope of the Rocky Mountains in Colorado.

The east arch ring is primarily for auxiliary mechanical equipment and the plant dewatering system. The west ring provides space for the plant ventilation duct, a cable shaft, an elevator shaft, and stair-well.

The intermediate-structure walls are designed to avoid concrete shrinkage and leakage through the construction joints. Exterior walls to El. 8,220, varying in thickness from 6 ft. at the bottom to 5 ft. at El. 8,220, are artificially cooled during concrete placement and for seven days thereafter. A system of metal sealing strips is provided in all joints to reduce percolation. In addition, steel intake and discharge pipes extending through the walls are provided with percolation rings, and the joints in blocks surrounding the pipes have special pressure-grouting systems.

The rectangular superstructure above El. 8,287.50, which is 50 ft. in height, has facilities for a complete machine shop in the east portion and houses a 50-ton traveling crane. The west portion of the superstructure contains three floors, with space for office and control rooms, rest rooms, a telephone room, and tool and first-aid rooms on the ground floor.

The plant will be headquarters for all project-area operations, including major repair work. Controls are centralized here, as are gages showing amounts of water being diverted and the elevation of the various reservoirs. The gates at the west portal of the Adams Tunnel and at Shadow Mountain Dam can be remotely controlled from this point and pumping regulated accordingly.

The second floor of this part of the structure will house a battery room, ventilating equipment for the plant as a whole, an electrical laboratory, and switchgear. The third floor will house the elevator equipment.

Discharge conduit and canal

Water discharged by the pumps will pass into 87-in. concrete-encased steel pipes for a horizontal distance of about 180 ft. At this point, the three discharge pipes converge through a concrete-encased steel wye to the 11-ft. reinforced-concrete discharge pipe, through which water will pass some 3,500 ft. to the pump canal. A siphon and thruster-operated siphon breaker are to be located near the upstream end of the conduit at El. 8,369, about 130 ft. from the canal.

The steel discharge pipe is being furnished in the longest sections that can be conveniently transported to the job. Field welding will be necessary to incorporate the pipe into one continuous steel conduit. Concrete surrounding the pipe is to be heavily reinforced, and suitable anchor blocks provided.

The 3,500-ft. concrete discharge pipe has an internal diameter of 11 ft. and is being placed in sections varying from 8 to 26 ft. in length. Shell thickness of the units will vary from 24 in. at the lower end to 11 in. at the discharge end where lower internal pressures exist. The lower end of the conduit, for similar reasons, is more heavily reinforced. However, a double mat of reinforcement is provided in all units, but the reinforcement is not continuous between units. Metal water-stops are installed between each unit to reduce leakage.

The 1.9-mi. Granby pump canal has an invert slope of 0.000146, which makes a difference in elevation from end to end of only 1.37 ft. Under normal operating conditions, Shadow Mountain Reservoir will be main-

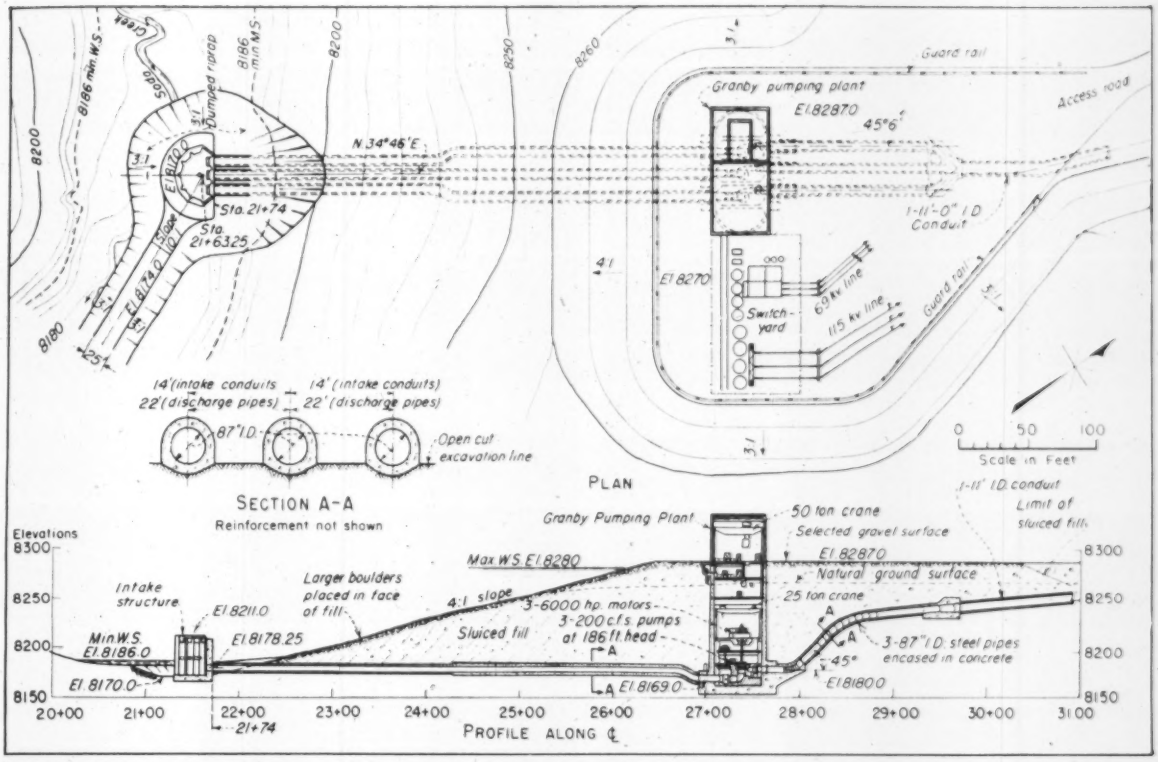

FIG. 3. PLAN AND PROFILE of the Granby pumping plant. Major elements are (from the left): an intake structure, three 7.25 ft.-dia. concrete conduits, the pumphouse and three steel discharge pipes that terminate in a single concrete conduit leading to an open canal, much of which will be in cut sections.

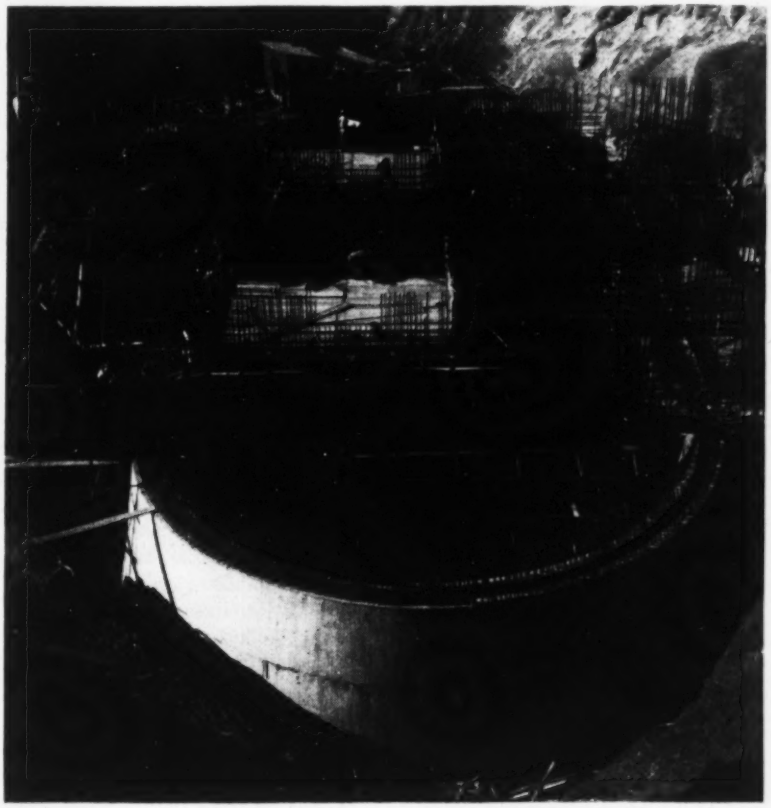

FIG. 4. PUMPING PLANT after placement of the first two lifts of concrete in all walls of the intermediate section of the structure.

tained at El. 8,366. The canal, therefore, will always have about 9 ft. of water in it.

The canal prism proper has a 20-ft. bottom width, a depth of 12.5 ft., and 2:1 side slopes. In the cut sections, which prevail for most of its length, a 12-ft. berm is provided on each side. Slopes above the berm vary from 1½:1 to 2:1, depending on the character of material encountered.

Where core banks are required, they are compacted to a height 11½ ft. above the bottom of the canal. Additional backfill will give an over-all fill height of 15 ft. above canal bottom, and the top of the fill will have a 16-ft. wide crest.

Existing irrigation ditches at three locations will be carried over the canal by means of 24 or 42-in. steel pipe. Also, a county road will cross the canal in one location by means of a 69.6-ft. span, steel-beam and timber-decked bridge, designed for two lanes of H-10 loading.

At the terminal end of the canal—where it enters Shadow Mountain Reservoir—a reinforced-concrete gate structure will be built to make possible dewatering of the canal for re-

pairs. The structure will have two 9 by 12-ft. steel radial gates, the necessary operating equipment, and a roadway slab over the top.

Dike and diversion channel

In locating the intake structure of the pumping plant in Soda Creek, consideration was given to the probability that silt and sand would be washed around the intake by the stream when the reservoir was low.

As a precautionary measure, a dike was placed across Soda Creek one-half mile above the intake structure to desilt the water. A channel 2,500 ft. in length was excavated from the desilting basin thus created to an adjoining stream which flows into the reservoir at a considerable distance from the plant. Thus, silt carried by the spring runoff or by flash floods is either dropped in the desilting basin or is diverted.

The dike is 400 ft. long and has a maximum height of 33 ft. above foundation. Outer slopes, both up and downstream, are constructed 2½:1, and the dike has a crest width of 15 ft. With a crest elevation of 8,242, the dike was designed to be overtopped and submerged with the reservoir at maximum storage level, El. 8,280. Therefore, up and downstream slopes are provided with a 3-ft. layer of selected gravelly material which was separated from the finer material used in the main fill and obtained from the diversion channel excavation.

The channel has a bottom width of 15 ft. and 2:1 side slopes. The required excavation of 98,725 cu. yd. of materials from the channel and dike foundation was accomplished by dragline. Fill in the dike, involving 18,183 cu. yd., was transported by carryalls and by bottom-dump trucks. Materials were spread by dozers and compacted in 12-in. lifts by fill traffic. Density tests indicated that an optimum compaction of 98 percent was obtained.

The electrical switchyard will be located at the southeast end and adjoining the pumping plant.

CONSTRUCTION OPERATIONS

Severe winters in the Granby area limit the period for economical construction to a short working season, except for rock excavation in some cases and underground work. Concrete can be placed without protection for only about four months in most years, and earth-fill placement is generally controlled by frost that sets in about November 10 and lasts until about May 10. Construction progress in 1947 was affected by the severe winter, and work on the concrete structures was stopped after November 3.

Granby Constructors completed all major excavation on the pumping plant during the 1947 season. This involved removal of 375,000 cu. yd. from the pumping plant, intake conduit, and discharge-conduit sites. The material encountered consisted of 10 to 25 ft. of clay, silt, sandy gravel, and top soil underlain by the local North Park formation of siltstone, sandstone, and shale. Rough excavation was done by 1- to 3-cu. yd. power shovels without resorting to the use of powder.

Principal excavation for the pump plant, intake conduits, and concrete-encased discharge pipes was carried on a 1:1 slope in the silty, sandy, and gravelly overburden overlying the North Park formation. A 10-ft. berm was constructed as a safety measure in the deep excavation for the plant and intake conduit on the harder North Park formation, which was also excavated on 1:1 slopes. The final hand-graded foundation was treated with asphalt emulsion to prevent air and water slacking.

No concrete was placed until all excavation was completed for the pumping plant substructure. Intake conduit-construction is shown in Fig. 5.

Concrete materials and plant

Aggregate for the concrete work was produced under two earlier contracts and processed from river deposits about a mile below Grand Lake on the Colorado River prior to inundation by the Shadow Mountain Reservoir. The aggregate is furnished in five sizes: sand (0-3/16 in.); 3/16 to ½-in. gravel; ½ to 1-in. gravel, 1 to 2-in. gravel; and ½ to 1½-in. gravel. Aggregates were stockpiled at the plant site.

The modified Type II cement for the work is furnished by the contractor and is tested by the National Bureau of Standards. It is shipped by rail in bulk and in bottom-dump cars to the contractor's track-storage silo at Granby, Colo., 11 mi. from the pumping plant. From this point, it is transported by airtight dump trucks.

Darex is used as the air-entraining agent for all the work at the pumping plant and has provided an average of 4-percent entrained air using approximately 160 cc. per cu. yd. of concrete.

All concrete is made in a fully automatic central batching and mixing plant. The plant consists essentially of a four-story structure with a 4-compartment aggregate bin and cement silo on top. Water is supplied from an adjacent storage tank.

The batching floor is immediately below the aggregate bins and cement silo and the entire plant operation is controlled by one man from this point. On the first floor above the ground level, a 2-cu. yd. tilting-type mixer has been installed, which deposits the mixed concrete directly into 1 or 2-cu. yd., bottom-dump buckets mounted on flat-bed trucks.

Cement arriving at the plant from the railhead is dumped directly into a road-level hopper to be elevated to the top of the cement silo by bucket conveyor. Aggregate in stockpiles immediately behind the plant is loaded into dump trucks either by a tractor excavator or by a 1-cu. yd. clamshell. A belt conveyor elevates the aggregate to the top of the mixing plant from a road-level hopper.

Placing the concrete

Fresh concrete is delivered to the forms in buckets on the flat-bed trucks, and a dragline converted to a crane with a 100-ft. boom is used to hoist buckets to the forms. Similar practice is employed in the placing of concrete in the conduits. For the coming season, the contractor is now erecting a 125-ft. boom Whirley crane for handling concrete to reduce the haul by trucks and ease congestion in the intake-conduit area.

Concrete is consolidated in the forms by vibrators, either pneumatic or electric, and of varying sizes, depending upon the working area within the forms.

Curing is accomplished by the use of a white-pigment compound on most unexposed surfaces, but hori-

zontal or vertical construction joints and all surfaces to be permanently exposed to view are water-cured, either by direct sprinkling or by covering with saturated burlap or cotton mats. Joints are prepared to receive the fresh concrete by sandblasting or by "green-cutting" of the surfaces by high-pressure-air water jets. Both methods are giving good results.

Reinforcing steel is purchased from the supplier, cut and bent. However, fabrication of the reinforcement cages for the conduits or mats for other features is done in the job steel yard, and the prefabricated cages are then transported by truck to the placement site and set by cranes.

Wherever possible, the contractor has obtained steel forms or has fabricated re-usable wooden panel forms. Steel forms are employed in the forming of the inner and outer portions of the intake and discharge conduits, except for the short-radius vertical and horizontal curves. Wooden forms are specified for the pump plant proper.

In an attempt to present a pleasant appearance to the structure walls, the contractor is required to run the form lagging in one direction in any one integral portion of the plant or other feature. That is, it must be run either vertically or horizontally and not changed until a logical break such as a floor occurs. Several types of form ties have been used, but the "she-bolt" type appears to be in favor for supporting the heavier and thicker walls.

Progress on the canal

At the end of the last construction season, the contractor had completed about 70 percent of the excavation required in the canal contract. Where possible, tractor-pulled scrapers and earth movers were employed. However, in more rocky portions of the excavation, a 2½-cu. yd. dragline was used by casting the excavated material to the canal banks or loading 12-cu. yd. end-dump trucks.

In some of the canal sections, the dragline boom was replaced by a shovel boom to speed up the work. In one 1,500-ft. stretch of the canal, saturated silt and fine sand was encountered, making traffic over or through the area impossible during the summer and early fall months. This section was partly excavated after it had become frozen.

FIG. 5. INTAKE CONDUITS leading to the pumphouse, which is being erected in the far background. This shows the status of construction on the conduits when the 1947 working season came to an end.

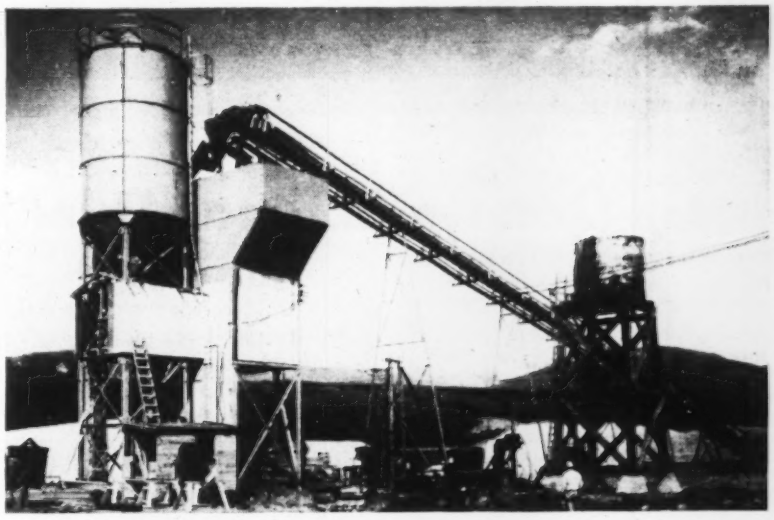

FIG. 6. AUTOMATIC central concrete batching and mixing plant erected by the Granby Constructors for use in construction of the pumping works.

The cement, air-entraining agent, and the reinforcing steel for the canal structures is furnished by the contractor. Aggregate is supplied by the government. The contractor's concrete plant last season consisted of two portable 1-cu. yd. non-tilting-type mixers, which were moved as the work demanded.

Personnel

The Granby pumping plant and pump canal are being constructed by the Bureau of Reclamation. Design and construction procedures were prepared under the direction of Chief Engineer Walker R. Young.

The work is located in the South Platte River District, Region 7 of which Avery A. Batson and E. S. Huntington are regional director and district manager, respectively.

Construction in the area is under the general supervision of Construction Engineer George R. Highley. The writer, as field engineer, is responsible for construction details in the Granby area of the Colorado-Big Thompson project, and C. S. Scribner is resident engineer.

E. H. Honnen, as project manager, is in charge of the work for the Granby Constructors and H. F. Lilley is Superintendent for Vinnell.

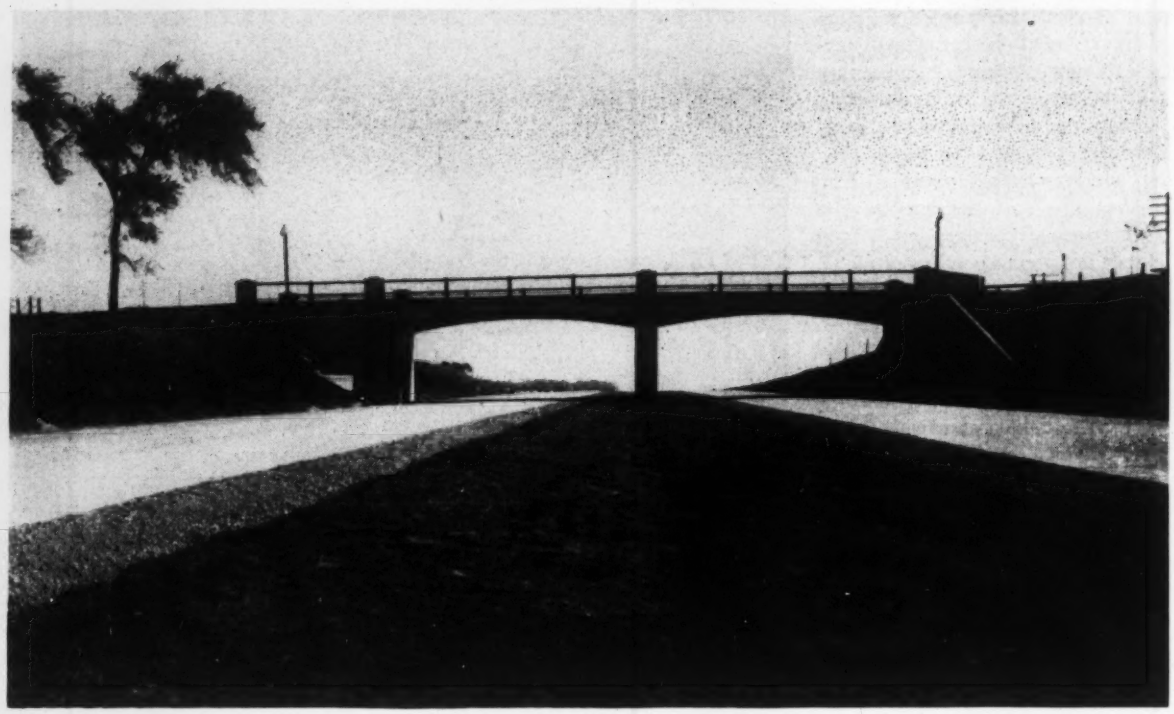

FIG. 1. A WIDE MEDIAN ZONE between the pavements has been provided on King's Highway No. 2A for snow storage.

Ontario Extends Dual Highway

As part of its program to provide a new dual highway for all routes in Ontario where traffic exceeds 5,000 vehicles per day, the Ontario Department of Highways recently put into service an extension of a new highway extending easterly from Toronto toward Montreal.

Work on this new divided highway, east of Toronto parallel to Kings Highway No. 2 along the north shore of Lake Ontario, was begun in 1937. It had reached West Hill, a distance of about 16 miles from Toronto, when construction was stopped by the war. The new section extends from West Hill to Oshawa, Ont., a distance of 18.8 miles, thus providing a new route east from Toronto to that city. To the west of Toronto, the Queen Elizabeth Highway is a similar limited-access highway to Hamilton, Niagara Falls and Fort Erie, opposite Buffalo—a distance of 97 miles.

The new route is known as King's Highway No. 2A. As will be seen in the accompanying cross-section, its roadway consists of two 22-ft. wide concrete pavements separated by a 30 to 32-ft. wide median zone. The concrete pavements have a uniform thickness of 9 in. and are supported on a 12-in. granular base coarse 26-ft. wide. Shoulders are surfaced with 2.5 in. crushed stone.

An unusually wide median zone was included in the design of this highway to provide ample space for storage of snow during winter months. Its surface is all below pavement level, being depressed 1.5 to 2.5

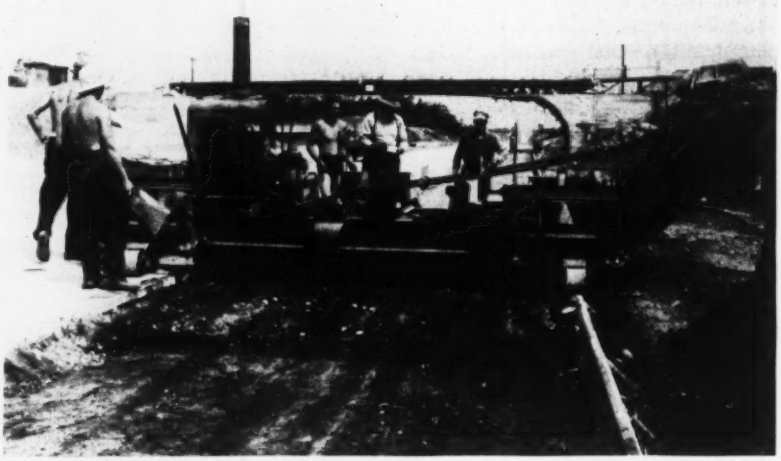

FIG. 2. GRADING for an access lane at the Lansing cutoff clover-leaf. In the background is one of the long-span overpass structures.

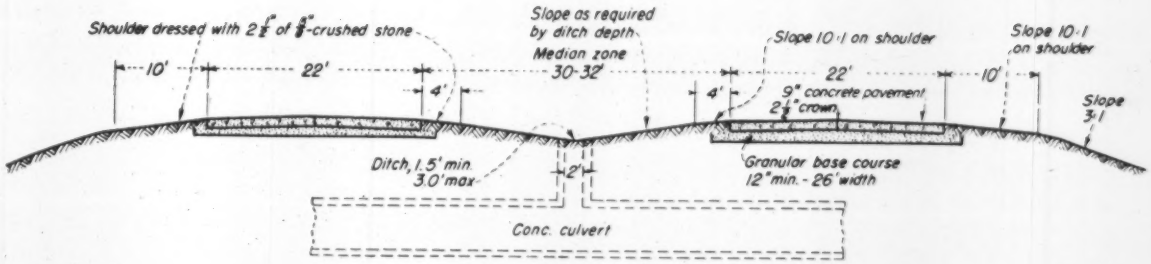

FIG. 3. Typical cross-section of the King's Highway No. 2A between West Hill and Oshawa in Ontario. The surface of the median zone is pitched to drain to the center to keep water from melting snow off the pavements.

ft. at the center to make certain that drainage will all be away from the center of the pavements. This was done as a result of experience gained on the Queen Elizabeth Highway where the median is narrower and raised slightly above the pavement.

Ample drop inlets have been installed in the center of the median zone draining to cross culverts to remove the runoff from rain and melting snow.

No expansion joints were included in the pavements, but construction joints are spaced at 20-ft. intervals. A rubber-base filler was poured into both these joints and the longitudinal joints following completion of the pavement.

Vinsol resin was ground into the cement for the pavements at the mill. to increase the air entrainment.

Grades separated at crossings

There are 11 grade separations along this 18.8-mile section of the highway, eight of which have connecting roads to provide for traffic interchange.

Four of the grade separations employ 108-ft. span cellular-type rigid-frame concrete bridges with structural-steel cores. This type is entirely new to Canadian practice although it has been used in this country. The spans were designed to be supported at two points near the center during construction so that they would not interfere with work on the highway below. Abutment wings are cantilevered to minimize footing excavation.

Twin bridges were used at river crossings because of the wide median zone.

Highways of this type cost the government from $200,000 to $300,000 per mile at present.

The work was carried out by the Ontario Department of Highways. George H. Doucett, minister of highways, and A. A. Smith, chief engineer. The field work was under the direction of D. G. Ramsey, division engineer at Toronto.

Contractors were Curran & Briggs, Ltd., Toronto, Brennan Paving Co., and MacHaffie-Birge Co., Hamilton.

1947 Gas Taxes Total Over $1 billion

Motorists paid state governments a record of $1,186,000,000 in gasoline and other auto fuel taxes in 1947, the Federation of Tax Administrators reports.

The total was 12.2 percent higher than the previous record set in 1946. An additional $108 million was collected from this source last year but refunded because the fuel was used for agricultural or other non-highway purposes.

Part of the increase was contributed by higher motor fuel tax rates in eight states. California increased its rate 1.5 cents per gal., Colorado 2 cents, Connecticut 1 cent, Maine 2, Rhode Island 1, Maryland 1, Nevada 1.5, and Vermont 0.5 cents.

California led the field in motor fuel tax collections with $106 million gross, a 34.8 percent increase over 1946. Texas was runner-up with $81.6 million, New York third with $79.3 million and Pennsylvania fourth with $70.0 million. These states led all others in motor fuel consumption. At year's end, the California tax rate was 4.5 cents per gallon, and in the other states 4 cents per gallon.

Kentucky increases tax

This year, Kentucky is the only state so far that has changed its motor fuel tax rate, increasing it from 5 to 7 cents a gal. That puts it on a par with Florida, Louisiana and Tennessee, the only other states where the rate is that high.

The Louisiana state Senate currently is considering a bill already approved by the House to increase the gasoline tax from 7 to 9 cents. A proposal to increase the Missouri rate from 2 cents to 3.5 cents per gal. will be submitted to voters of that state this fall.

The record tax payments coincide with Public Roads Administration reports of greatly increased vehicular travel on the nation's roads.

PRA reports increase in motor vehicle traffic

Motor vehicle travel on highways in the United States is steadily increasing, according to figures compiled by the Public Roads Administration of the Federal Works Agency.

Reports for the month of May (the latest figures available) indicate that traffic on rural highways established an all-time record for that month with a total of 17,291,000,000 vehicle-miles recorded. This represented an increase of 7.3 per cent over the volume of travel in May, 1947, and was 14.6 per cent greater than the travel volume in May, 1941.

In eastern states the volume of travel was a little lower than in May, 1941, but was higher than in the corresponding month of 1947. However, an increase over any previous May was shown in the central and western states.

Travel on city streets was up 6.5 per cent from May, 1947.

Michigan Studies Backfill Consolidation

State highway department's tests furnish some answers to problem of consolidating fill material

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Aiming toward halting damage to paving on trench backfill, bridge approaches and embankments, the Michigan State Highway Department recently completed a series of extensive consolidation and gradation studies.

The consolidation studies were divided into four steps. Small scale laboratory tests on consolidation of granular materials by tamping, ponding and vibrating were made at the department's testing laboratory in Ann Arbor. Larger tests of the same methods of consolidation were made at the department's research laboratory in East Lansing. Materials were dune sand, natural sand, bank run gravel, course aggregate and slag. Consolidation was obtained by tamping, ponding, and by vibrating with a bullet-nosed concrete vibrator.

The third step was consolidation of large masses of bank run gravel by vibration, chiefly to study different types of vibratory equipment. A fourth investigation was consolidation on actual field projects with various types of equipment, working with the granular materials available in those particular areas.

Consolidation results

Conclusions formed as a result of the laboratory tests in the first two steps of the investigation may be summed up briefly as follows:

There is no material that can be placed without compactive effort that will not result in detrimental settlement.

Sand or well-graded bank-run gravel will give the greatest density with the least compactive effort. Coarser particles will require the greatest compactive effort.

Moisture content has no appreciable effect on densities of compaction by vibration, but it has a great effect on those produced by tamping or inundation.

Tamping may be used on any granular material and maximum densities can be obtained if the material is tamped in layers of 4 to 6 in. or less.

When granular material is to be tamped in place the moisture content should be at or near optimum as determined by AASHO Test T-99.

The third series of tests—to study different types of vibratory equipment, using bank-run gravel—were conducted at Scottsville, Mich. A 16x10-ft. bin, 8 ft. deep, was constructed of 3-in. lumber secured in place by posts set solidly in the ground. County maintenance equipment was used to charge the bin and to handle the larger types of vibrating equipment.

Bullet-nosed vibrators

The first vibrator unit used, a bullet-nosed concrete vibrator (E), was ineffective in the larger mass of soil material. The equipment consolidated a very small area in the vicinity of the vibrating head and had little or no effect 8 to 10 in. away.

However, it was still believed that some type of penetrating vibrator was desirable. Penetrating vibrators (F) were constructed in the belief that, if effective, they would permit the placement of material in thick lifts. However, the operation of these units in the gravel mass produced much the same effect as the bullet-nosed vibrator. Good consolidation was obtained in the area immediately surrounding each tine of the unit but did not extend to the adjacent tine.

Penetrating vibrators ineffective

The idea of developing a penetrating type of vibrator was abandoned and efforts were turned to the development of a vibrator that could be operated on the surface, thereby imparting a force to the layer of fill similar to that of a heavy track-type tread tractor.

The first equipment of this type studied was a backfill tamper operated by a 110-v., 3-phase, 60-cycle a.c. motor (G), with a striking member forged integrally with the rotor shaft. Good densities were obtained but the method was slow due to the size of the tamping plate. Moreover, it was necessary to handle the apparatus entirely by manual labor and the layers of material could not exceed 6 in.

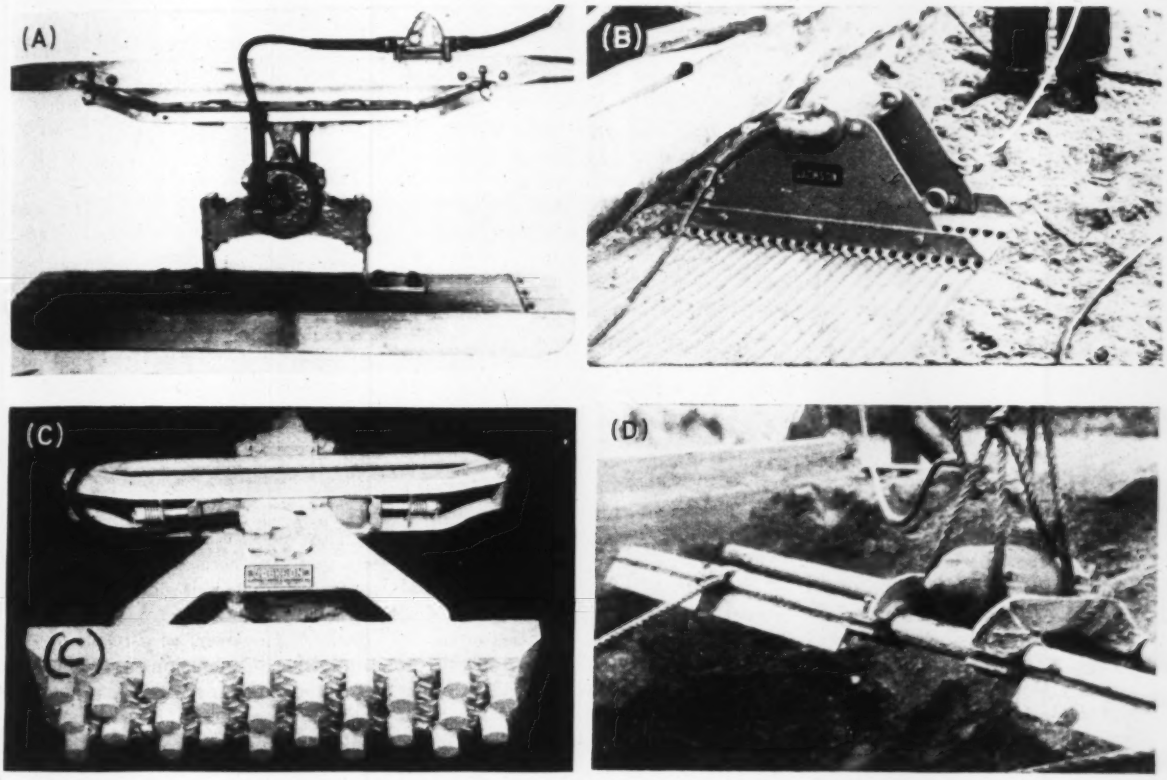
Platform vibrators satisfactory

Next, a platform vibrator (A) was found to be very effective and, while it also was manually operated, satisfactory densities over larger areas were obtained more rapidly than with the smaller tamper. Results obtained by this unit encouraged the construction of a larger platform vibrator which would consolidate relatively large masses of granular material at a rate that would cause little if any delay to the contractor's operations. This unit must be handled by power equipment and is not adaptable to confined areas around structures.

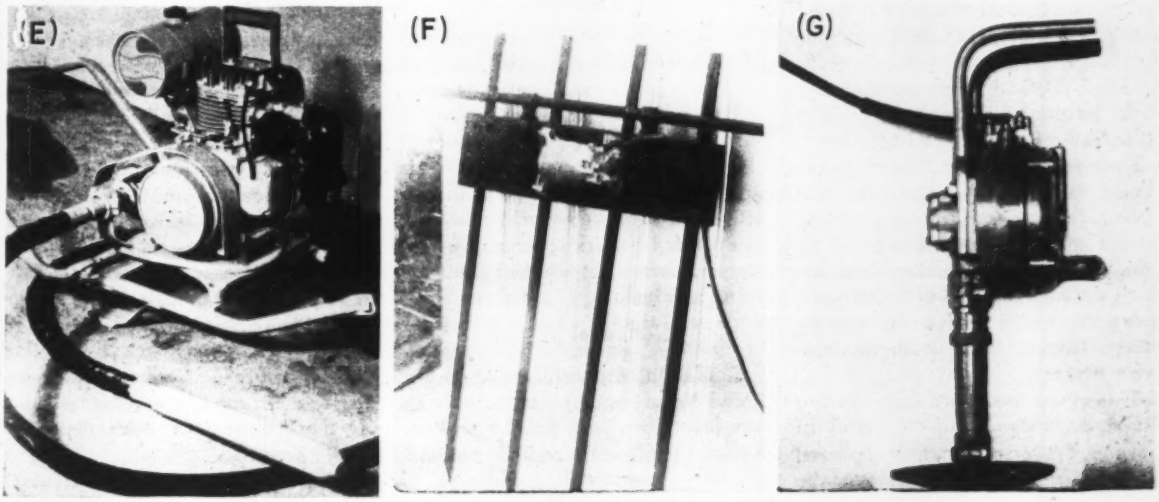
The work of the larger unit was very satisfactory and, as a modification, it was decided to make similar tests using a standard paving tube vibrator. It consists of a vibrator motor, mounted crosswise at the center of two 8-ft. lengths of $2\frac{3}{8}$-in. tubing. The standard tube was found to float on top of the material and much of the vibrating effect was lost. Consequently, a piece of $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{1}{8}$-in. angle iron was welded to the front tube.

When operated at about 4,000 vibrations per minute and pulled down a sloping face of the material at about

BACKFILL CONSOLIDATION TESTS SHOWED THAT . . .



THESE WORKED—A small model of a platform vibrator (A) proved effective, and served as prototype for large machine. Modifications of the platform vibrator included one with a sheepsfoot base plate (C), and (B), one that travels under its own power at about 10 ft. per min. Another successful machine (D) was a standard paving tube vibrator with an angle iron welded to the front tube to improve vibratory action of the machine.



THESE DIDN'T—Among the machines found not suitable were: Bullet-nosed concrete vibrators (E), penetrating vibrator (F), and a surface vibrator (G). Both the bullet-nosed and penetrating types compacted two small an area; the surface vibrator had too small a tamping plate and could not consolidate material over 6 in. depth.

13 ft. per min. this machine (D) was very effective on relatively large quantities of material. The addition of the angle iron caused the unit to dig into the material, thereby tending to transit all compactive efforts to the granular material.

Final results of these studies clearly demonstrated the effectiveness of the paving tube type of vibrator. The small platform vibrator seemed to offer the greater possibilities for consolidating granular materials in confined areas and plans were formulated to continue the study and develop the equipment along the lines indicated by the study. No further study of the paving tube vibrator was considered necessary.

The platform vibrator was modified and tested on a project near the Cut River bridge on U. S. Highway 2 west of St. Ignace, involving the construction of a metal crib retaining wall. Each crib or cell was 10x10-ft. by 20 ft. deep. The crib was built in sections, with backfill being placed inside the cribs and in back of the wall, simultaneously with the crib assembly.

The 10x10-ft. cribs afforded an excellent opportunity to compare the vibrator compaction with the tamping done by the contractor, and also with loose densities of the material as it was shoveled into the crib.

Modified platform vibrators

In modifying the platform vibrator for this work, four different types of base plates were used. At this time it was noted that one of the units as modified (B) had a tendency to travel under its own power at a rate of about 10 ft. per min.

Dune sand, used to fill the crib, was placed in 9-in. lifts. To cover this 100-sq. ft. area with the tamper used by the contractor required 15 to 20 min. to obtain satisfactory density. With the traveling vibrator, the same area and equal or greater densities required from 3½ to 4 min., the tests demonstrated.

This vibrator also was used on two different bridge projects, one in Grand Traverse County between Kingsley and Traverse City over the Boardman River, and on a project south of Sparta on state route M-37. For these projects the vibrator was remodeled slightly for convenience in handling.

The most effective frequency for the granular materials used in this study was within a range of 2,700 to 4,000 vibrations per min. There is the possibility of encountering a material that will have an efficient frequency outside the range mentioned above. A study is being started at this time for developing a method to determine the most efficient frequency for different materials.

Layers of granular material 3 ft. thick have been consolidated satisfactorily with this type of equipment, but it requires a considerable length of time for consolidation. The most efficient thickness of layer for consolidation, found by this study, was 12 in.

One pass sufficient

In most cases one pass of the vibrator was sufficient to obtain densities of 95 percent or higher. Time-density curves indicate that satisfactory densities (95 percent) are developed in approximately 13 sec. Additional density is obtained rather slowly but it is believed that densities equal to 95-percent of the density as determined by the "cone" method or by the vibrating table are satisfactory and no detrimental settlement will occur in granular backfills or embankment compacted to this degree.

Additional studies are to be made on the equipment developed during this study and on other types of compacting equipment, for improving their efficiency. However, it should be clearly understood that to obtain satisfactory densities and thereby eliminate the present day settlements in backfills and embankments there must be some sacrifice in the speed of placing granular materials. While additional studies may lead to the development of more efficient vibrating equipment, definite conclusions have been reached as a result of the foregoing studies.

Conclusions of tests

Gradation of backfill material was found to be an important factor in any location where there is a possibility of infiltration of adjacent soil, subbase material, or infiltration of the backfill material into and through the drainage structure. Backfill around sub-structures of bridges or culverts where the adjacent soil is heavy clay and consequently would have no water moving through it would not require gradation control. However, if a granular subbase was to be placed over the top of the backfill material, some precaution should be taken to prevent the infiltration of the subbase fines down into the backfill material.

Conclusions offered

The question of the need for consolidation of granular material was definitely answered by this study, which found that volume changes as great as 19 percent could and do occur in granular fills placed without consolidation. This volume change varies with the type of material and the method of placement, but all granular materials—unless properly consolidated when placed—will consolidate under traffic and weathering, resulting in settlement of the surface treatment.

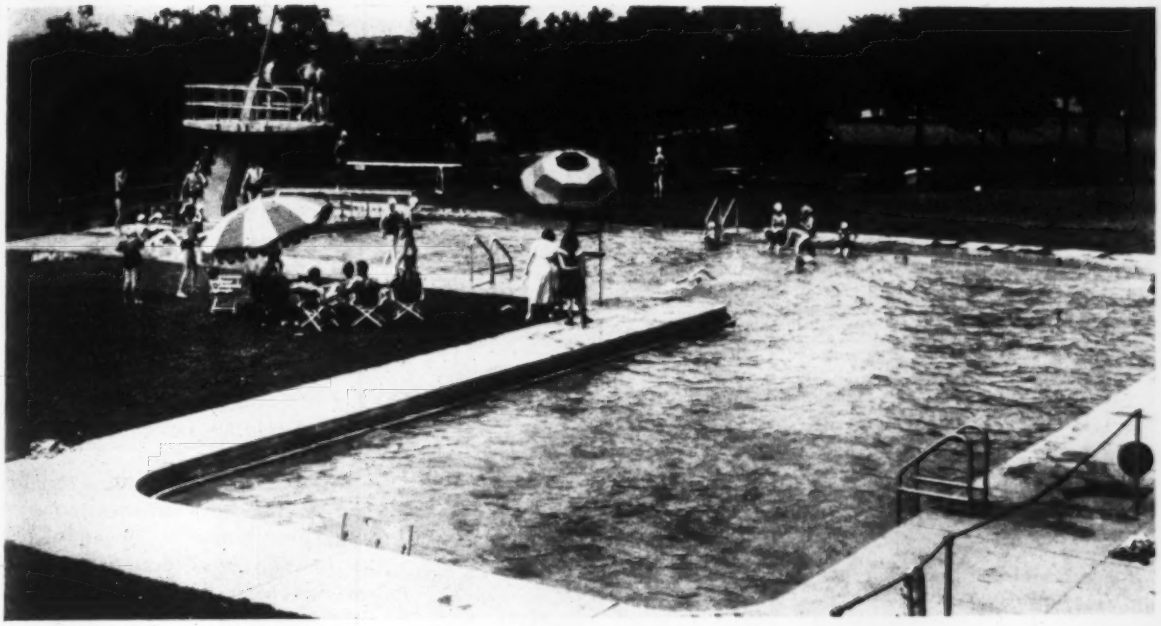
The conclusions regarding the most efficient methods of consolidating granular materials may change as data are obtained from additional studies. However, as a result of this study these conclusions are offered:

Satisfactory densities can be obtained by hand tamping and mechanical tamping if the layers are not over 6 in. thick. However, the method is slow and expensive.

Penetrating vibrators, such as bullet-nosed concrete vibrators and vibrating spears or tines, are not efficient because the vibratory effect is confined to a very small area adjacent to the vibrating member.

Surface type vibrators such as the modified paving tube and the self-propelled platform vibrators proved to be the most efficient. The platform type vibrator was found to give satisfactory densities on layers of material up to 12 in. thick. The paving tube type could be adapted to large unconfined areas, such as bridge approaches, embankments and granular bases. The platform type is especially suitable for those areas inaccessible to large equipment. The platform vibrator when used in a "gang" of four or more units is also adaptable to larger areas.

The cost of placing backfill when using vibrating equipment will be less than the cost when placed in accordance with the requirements of the current standard specifications of the Michigan State Highway Department.



Swimming-Pool Sanitation Practice

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City Health Department
Rockford, Ill.

Supervisory practices exercised by the Rockford, Ill. health department have been effective in maintaining its sixteen swimming pools in a safe, clean condition.

The program includes bacteriological, chlorine-residual and pH testing, regularized pool cleanings, bathhouse sanitation and treatment-plant inspection.

Water samples—taken from the pools each week—are analyzed soon after collection in the health-department laboratory. This procedure gives a quick, accurate picture of conditions in the pools, and precludes faulty reports due to changes in number and type of bacteria that might result from long intervals between collection and testing. When water quality does not meet the desired standard, pool operators are warned immediately.

Bacteriological analyses to determine if the coliform count is less than 100 per milliliter—the Rockford health-department standard for swimming pools—are made by the same procedures employed for drinking water. Presumptive tests for coliform organisms are followed by confirmation tests when necessary. (*Standard Methods for the Examination of Water and Sewage*, American Public Health Association, 9th ed.).

In addition, plate counts are made to determine the total number of bacteria in one milliliter of water. Total bacteria count is not considered as important as the test for coliform organisms, but it provides a measure of the sanitary condition of the pools.

Incubation at 32 deg. C.

To provide a more favorable environment for growth of all types of bacteria, agar plates for determining total bacteria are incubated at 32 deg. C. for 48 hours. The procedure deviates from incubation at 35-37 deg. C. recommended in *Standard Methods*. This change in laboratory technique, made in Dec., 1946, produced many more samples with higher bacteria counts than previously recorded (Fig. 2).

The 1947 record (Fig. 3) shows that the quality of swimming-pool waters, insofar as coliform organisms are concerned, compared remarkably well with the municipal supply. Private well supplies, however, contained considerably more coliforms than swimming-pool waters.

As recent evidence indicates that poliomyelitis virus as well as certain disease-producing organisms are destroyed more rapidly by free-residual chlorine, breakpoint chlorination to provide residuals of 0.5 to 1.0 is practiced at all pools. With this protection, sanitary quality is maintained even with heavy bathing loads.

Tests for chlorine are made immediately after the addition of orthotolidine to the water sample. If readings are taken five minutes later (standard procedure), total free and combined chlorine are measured. As combined chlorine produces much slower bactericidal effects, the five-minute determination is usually omitted.

Pool water is also tested for pH when samples are collected. The optimum range for pool waters appears to be 7.2 to 7.6 or slightly on the alkaline side. As pH rises above 7.6, effectiveness of chlorination is reduced. Skin and eye irritation may

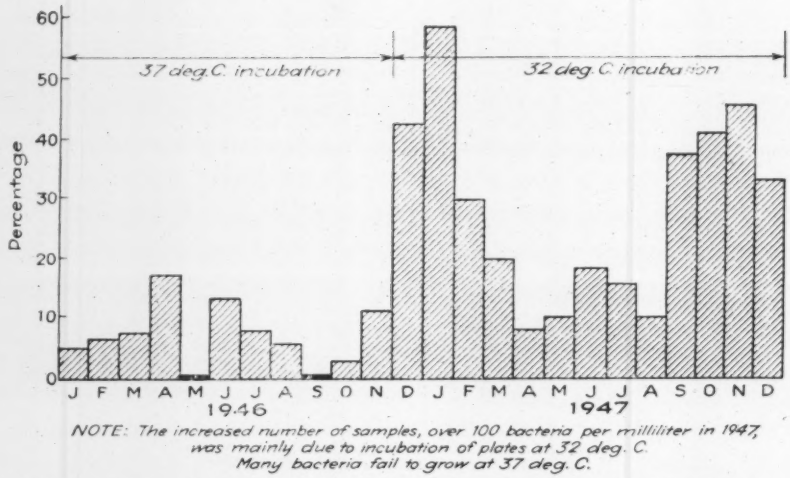

37 deg. C. incubation
32 deg. C. incubation
Percentage
60
50
40
30
20
10
0
J F M A M J J A S O N D J F M A M J J A S O N D
1946
1947
NOTE: The increased number of samples, over 100 bacteria per milliliter in 1947, was mainly due to incubation of plates at 32 deg. C. Many bacteria fail to grow at 37 deg. C.

Fig. 2. Started in Dec. 1946, bacteria counts on agar plates incubated at 32 deg. C. for 48 hr. instead of at 37 deg. C. for 24 hr. were considerably higher than previously recorded at Rockford, Illinois.

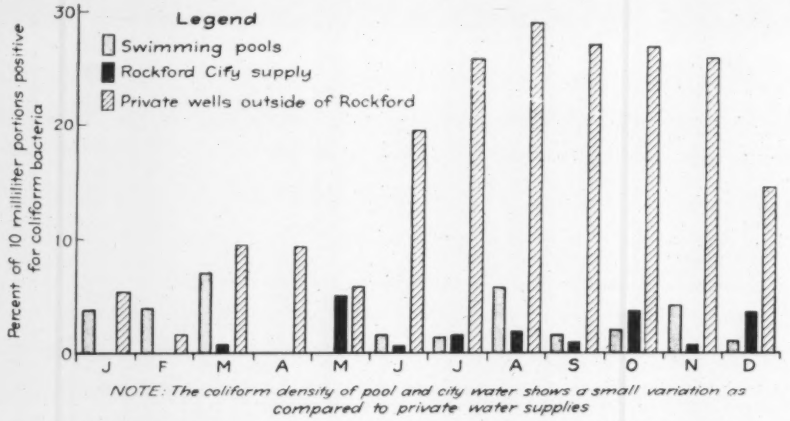

Legend
Swimming pools
Rockford City supply
Private wells outside of Rockford
Percent of 10 milliliter portions positive for coliform bacteria
30
20
10
0
J F M A M J J A S O N D
NOTE: The coliform density of pool and city water shows a small variation as compared to private water supplies

Fig. 3. In 1947, coliform bacteria in private well supplies greatly exceeded counts made on swimming-pool waters.

result when pH is below 7.0 or above 8.0.

Complete laboratory analyses of all pool samples taken during the preceding period are summarized at two-month intervals. Copies of the summary are sent to all managers, owners and school officials for comparison of operating results. By stimulating competition, distribution of performance data has contributed to improved operation of pools.

Chlorine-resistant bacteria

Chlorine-resistant bacteria become established in swimming pools at certain times. This is apt to occur if filter beds are improperly maintained. Such bacteria are more readily detected when total bacteria counts are reported. Although chlorine-resistant bacteria are not believed to have pathogenic significance, their presence in large numbers (exceeding 1,000 per ml.) is highly undesirable and indicates faulty water treatment.

Elimination of chlorine-resistant bacteria usually requires special treatment methods. Thorough cleansing of filters with lye or sodium bisulphate has been employed successfully. An increase of the chlorine dosage five or ten times for a day or two while bathers are excluded frequently gives satisfactory results.

When a water supply contains large amounts of bicarbonate hardness, dense fine-grain deposits of lime accumulate on the bottom, sides and overflow troughs of pools. Deposition of lime can be prevented and existing layers can be dissolved by addition of about 2 ppm. sodium hexa-metaphosphate at periodic intervals. Excellent results have been obtained at three pools where this treatment has been used for seven years. A description of the method employed is given in "Report on a Study of the Removal of Lime from Swimming Pools with Sodium Hexa-meta-phosphate," Gunderson, Porter and Galvanoni, *Swimming Pool Date and Reference Annual*, Beach and Pool, New York, N. Y.

Use of relatively stable germicidal agents—such as quarternary ammonium halide compounds—to sanitize showers, floors, pool deck, locker-room floors and bathing suits greatly reduces number of bacteria carried into pools. This is especially true for heavy bathing loads. In addition, germicides minimize and often prevent fungus infections on feet and other parts of the body.

The Rockford health department is directed by Dr. N. O. Gunderson, health commissioner. C. W. Anderson is laboratory director.

No Water Shortage Seen for San Fernando Valley

In a season when water tables in most parts of central and southern California have sunk to alarming and costly depths, portions of San Fernando Valley, Calif., are experiencing exactly opposite conditions.

In one area of the fertile valley, 100 acres of truck crops have been "drowned" by a subterranean "mound" of water which rose to within six inches of the ground level. Preliminary studies indicate that old wells—used prior to construction of the Owens River Aqueduct—are becoming artesian wells through pressures caused by mountain runoff into the subterranean basins.

Engineers of the Los Angeles Department of Water and Power and of the Division of Irrigation of the United States Department of Agriculture's Soil Conservation Service have joined in a survey to develop remedies for this abnormal condition, which has already caused flooded basements and disrupted cesspools.

Reynolds Metals Co. photo

Aluminum built-up roofing is mopped in place with asphalt at Kearny, N. J.

Metal Replaces Felt in Built-up Roofing

Built-up roofing of aluminum was used recently to replace 32,000 sq. ft. of worn-out topping on the Tompkins Tidewater Terminal building in Kearny, N. J. In this novel operation, 0.004-in. thick, commercially pure aluminum, annealed and soft-embossed to increase its workability, was substituted for conventional asphalt felts.

One square of this material weighs 6 lb. Built-up roofing composed of it is said to weigh only one-sixth as much as the conventional 20-year roofing, assuming no gravel or other top dressing is needed.

Other advantages claimed include protection of underlying asphalt and felts, insulation through reflection of sunshine, and fire resistance. Estimates based on exposure tests place the life of the roofing at 25 years or more.

Number of operations reduced

Once the roof deck had been prepared to receive the roofing, only five steps were required to apply the metal covering, as compared to eleven for conventional 20-year pitch-and-gravel built-up roofing. The five operations consisted of placing the following materials in order: a layer of 30-lb. asphalt felt, hot asphalt, one ply of aluminum roofing, hot asphalt and a second ply of the metal.

The 30-lb. felt was placed on the 2-in. cane-fiber insulation that covered the existing deck. Sides of the felt were lapped 2 in., ends 6 in., and the laps were nailed at 6 in. centers. The center of each sheet was staggered-nailed lengthwise, with rows 10 in. apart and nails 18 in. c. to c.

About 30 lb. of asphalt per square per mopping, at a temperature of from 350 to 400 deg. F., was solid-mopped on the felt. Then, application of the aluminum roofing started with the embedment in the asphalt of an 18-in. wide starting strip along one edge of the roof.

Standard sheets came to the job in 36-in. wide rolls, each containing 10 squares and weighing 63 lb. Each strip had center and side-lap scoring to simplify the laying of straight seams.

A full 36-in. wide sheet was placed to completely cover the starting strip. Succeeding courses of 36-in. sheets were then applied over the entire roof area, with side laps of 9 in. and end laps of 6 in. As the metal was rolled in, the hot asphalt was mopped close in advance of the roll to assure good adhesion and was extended at least 1 in. beyond laps. The aluminum was thoroughly brushed with a heavy broom to insure close contact with the asphalt over the entire area.

The contractor—A. Ratner & Co. of East Orange, N. J.—says he found the going on this job somewhat slower with aluminum roofing than usually experienced with felts. However, he believes that the cost was not more than that of a conventional 20-year roofing.

Machine Computes Survey Data

Automatic computation and summation of latitudes and departures is the primary function of a machine that was described recently by R. M. Wilson, U. S. Geological Survey, in a paper given at the annual American Congress on Surveying and Mapping meeting in Washington.

The survey computer, designed and built by International Business Machines, following general specifications of the Engineer Research and Development Laboratory at Fort Belvoir, Va., is a combination calculating machine, six-place natural sine and cosine table and electric typewriter. The operator, confronted by a typewriter keyboard with a row of calculator keys added below the space bar, sets degrees, minutes and seconds on the lower row and punches a key. The typewriter automatically records the azimuth while the calculator takes the sine and cosine from the trig table. The operator then sets the length of course on the lower key row, punches a button and the typewriter automatically records distance, latitude and departure. Cumulative totals, with correct algebraic signs, are carried on the record. The machine weighs about 600 pounds. It can be adapted for area computation by the double-meridian-distance method, sine law computation and other surveying operations.

Other devices described by Mr. Wilson include an elevation-meter for use in automobiles, a disc slide rule for ready-reading polaris hour angles, magnesium level rods and an electrical analogy survey-net adjuster.

UNAUTHORIZED REPRODUCTION PROHIBITED

On a tributary of the Yangtze River, Chinese engineers supervise workmen who are building a new dam almost exclusively by hand.

China Pushes Power Development

D. Ben Gumensky

Chief Designing Engineer
National Hydroelectric Engineering Bureau of China

At the conclusion of World War II China had under consideration a comprehensive plan for the rehabilitation and industrialization of the country under the auspices of the National Resources Commission of China. This commission was organized by the government in April, 1935, to fulfill four functions:

(1) Develop basic industries

(2) Develop important mining enterprises

(3) Develop power enterprises

(4) Exercise administration over other enterprises as may be designated by the government

Because power development is the key to the industrialization so sorely needed in China, the planned program provides for immediate development of about 840,000 kw. in steam and 280,000 kw. in hydroelectric plants, with the expectation of doubling both of these figures within five years.

To expedite consummation of this program the National Resources Commission formed the National Hydroelectric Engineering Bureau which has been busily at work for three years on the planning, surveying, designing and construction of the much-needed power developments. A controlling factor in this work has been the relative instability of China's monetary system and the dire scarcity of foreign capital, such as U. S. dollars.

Within a year after V-J Day, Communist activities started to undermine political and economic stability in China with military offensives that have increased in intensity with the passing of time. As a result, economic and political crises have developed at an alarming rate and are causing an inflation that paralyzes the efforts of the most careful planning and slows all progress.

In spite of this difficult and discouraging situation, the work of the National Hydroelectric Engineering Bureau is being carried forward steadily (see *ENR* Oct. 2, 1947, vol. p. 85, "Sungari River Dam Declared a Hazard," and "Concrete Making in China," by John S. Cotton, *Journal*, ACI, January, 1948). Survey and exploration work has been undertaken in all parts of the country and much planning and designing is being done in anticipation of better times.

Inflation a hazard

Construction suffers from the inflation more than any other activity and as a result very little construction now is being done. The most notable project now under way is the upper Tsing Yuan Tung diversion dam and powerhouse, part of a planned, integrated development of the Lung Chi River—a tributary of the Yangtze.

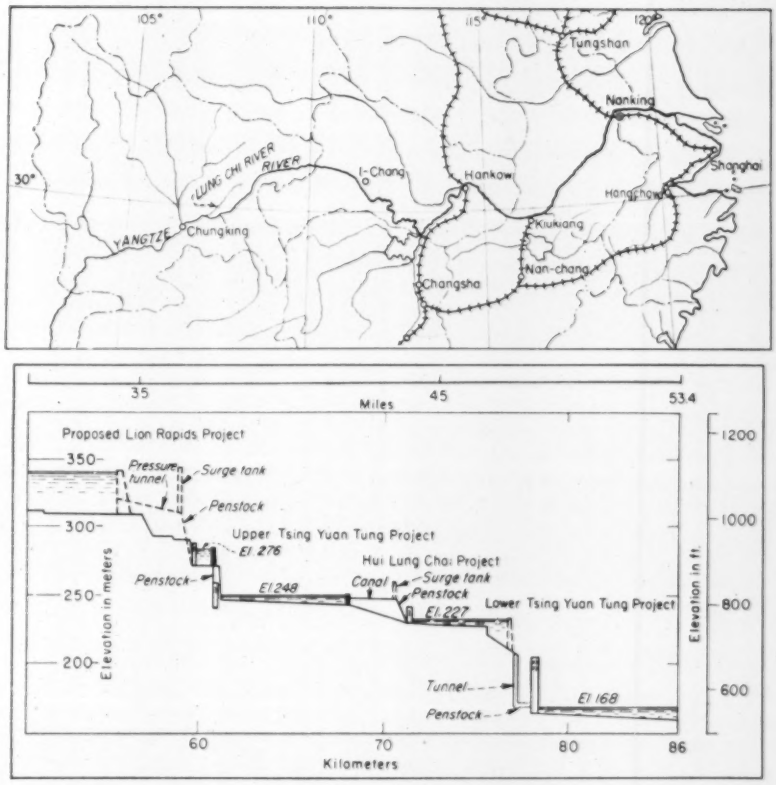
This series of power sites is located in eastern Szechuan Province about 60 miles east and downstream from Chungking. The Lung Chi is about 80 miles long and the fall is largely concentrated in waterfalls and rapids near its lower end where the topography is well adapted to hydroelectric power development. This location was therefore selected as the site of principal power development for Chungking. The project as a whole calls for a series of four hydro plants on the river, developing a total of 64,000 kw. to supplement the present 16,000 kw. of steam power.

The first unit of this development, called Lower Tsing Yuan Tung, was started in 1937 and completed in

1942. It includes two horizontal Francis turbines, each of 1,000-hp. capacity, on the same shaft with a single 1,800-kva. generator. One of the turbines was built in England, the other in China. The generator was made from an old frequency changer. As this was written two more units, each rated at 750 kva., are being installed in this powerhouse. Eventually, 30,000 kw. will be installed in a separate powerhouse located near the existing plant.

Construction work on the 6,000-kw. second unit, Hui Lung Chai, was limited to a portion of the power canal and the diversion dam which provides storage capacity for the Lower Tsing Yuan Tung plant. It is planned to continue the construction of this unit as soon as possible, installing 2,000 kw. at this time. These propeller-type turbines and generators have been designed and will be made in China.

Building of the proposed 15,000-kw. fourth unit of the development, the Lion Rapids storage reservoir and powerhouse, would provide storage and flow regulation at the upper end of the series of plants on this stream, assuring more firm power from the plants below. Due to lack of funds no construction work has yet been started on this unit.



THE LUNG CHI RIVER location is within easy transporting distance of the city of Chung King. (Lower drawing) A profile shows the series of dams and power plants proposed for step-by-step development.

Upper Tsing Yuan Tung project

The third unit of the Lung Chi River development, the Upper Tsing Yuan Tung project, is needed now to provide power for the local electro-metallurgical works and also for the construction of the Lion Rapids Dam and tunnel. This unit, now under construction, is described in the following:

Simple in plan and construction program, this third unit consists of a masonry gravity overflow diversion dam, steel penstock and powerhouse. Advantage was taken of the waterfall by locating the diversion dam immediately above it, and the powerhouse just below, thus saving a considerable amount on the necessary height of the dam itself.

At this point the river flows over beds of sandstone washed clean by the water, hence excavation at the damsite was a relatively minor item. The formation is a thick bedded sandstone, generally weak and leaky. Above El. 266 (this is in meters, above sea level) are layers of shale that required special key- and cutoff treatment.

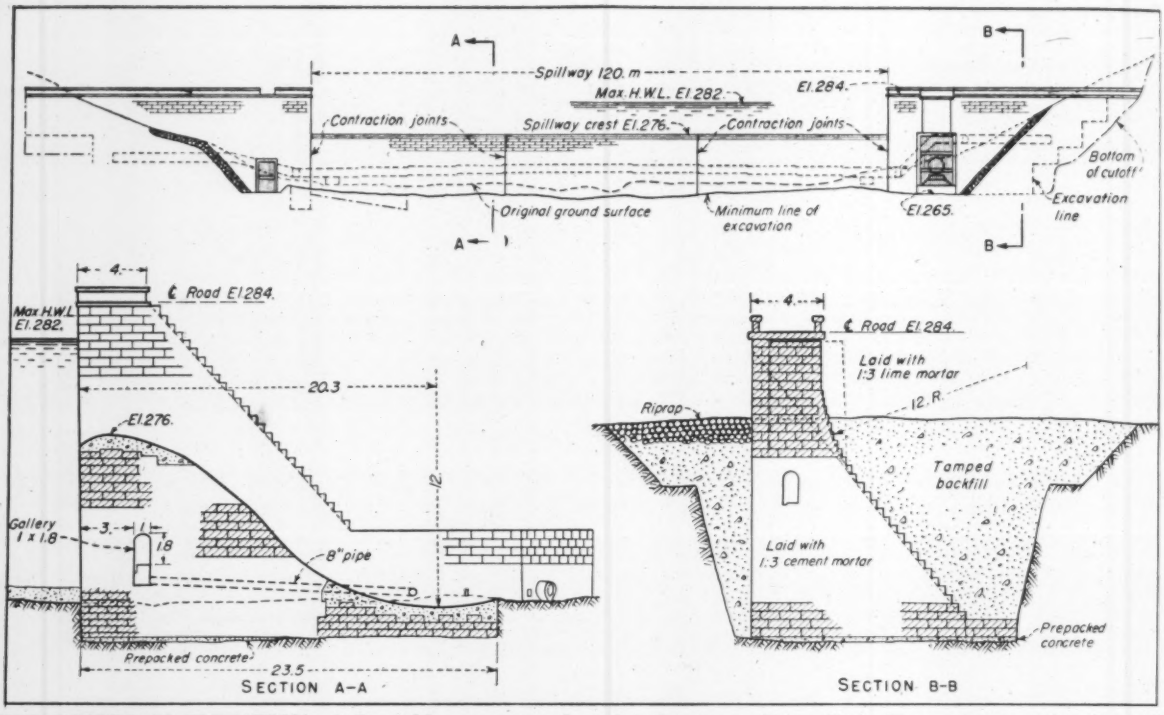
Construction on this project is carried out by force-account and by subcontracts. The subcontracts are executed informally with several leaders who employ, pay and supervise the workers. These "leaders" are not contractors within the meaning of the term as used in the United States. They control their following by regularly doling out rations, mostly rice, and this supply must be continued whether the worker is gainfully employed or not. In this way a "leader" maintains his following and, in fact, controls the labor market; it is almost impossible to gather up a crew of workers on any other basis in the inland districts. This method has the great advantage of avoiding the demoralizing effect of rapid and extreme variations in value of Chinese money.

Some items of construction, such as the production and laying of masonry, are based on unit price per cubic meter; in other cases the leaders furnish man-days of labor at an agreed price. The unit prices and labor rates are changed often to compensate for inflation of money. The mechanics, truck drivers, drillers and other specialists are on the payroll of the bureau in the same way as are engineers and other professional men. All materials and equipment, including cement, compressors, drills, etc., are furnished by the bureau.

Diversion dam

Diversion is made by an uncontrolled-crest, gravity, overflow dam that is being constructed of sandstone blocks laid in cement mortar entirely by hand labor. The maximum height of the dam from the foundation excavation to crest roadway is about 19 m. (62 ft.). The spillway crest length is 120 m (394 ft.) which, after adding the lengths of abutments, makes a total crest length of 233 m (764 ft.). The spillway was designed for a maximum flood of 130,000 cfs. A short bucket is provided below the spillway section but there is no stilling basin nor other means for dissipating energy.

In the left abutment a river outlet 1 m. (328 ft.) in diameter is controlled by a 4x4-ft. cast iron slide



THE UPSTREAM ELEVATION of the ashlar masonry dam for the upper Tsing Yuan Tung project (above), with sections through spillway and full-height portions of the dam, most of which are made of sandstone blocks carefully shaped by hand and set in lime mortar (lower section of drawing)

METHODS OF QUARRYING masonry blocks are the result of centuries of experience. The man in the foreground is dressing a block to finished dimensions.

COOLIES unload blocks from a barge that plies between the quarry and the dam site. Each block is carried by four to eight men; each pair of workers carries a bamboo beam.

gate, built locally. In the right abutment power intake is controlled by a 4.3x5.4-m. fixed wheel gate designed by the bureau. A fairly shallow cutoff, having a maximum depth of 4.5 m. (15 ft.,) is provided under the upstream toe of the dam. An inspection and drainage gallery extends the full length of the dam. Drain holes are provided at the downstream toe of the dam and under the drainage gallery to reduce uplift.

The foundation under the dam was consolidated by low-pressure grouting over the entire area. This was done through 2-in. holes 15 ft. deep, drilled with jackhammers and wagon drills. The holes were spaced on 3-m. centers both ways or closer, depending on condition of the foundation. Number and spacing of the grout holes were based on tightness of the foundation after grouting as shown by the capacity of the intermediate holes to take grout subsequent to the first grouting. Cutoff or curtain grouting near the upstream face of the dam was done through 3-in. holes put down with a wagon drill.

The average 1-m spacing of these holes was accomplished by first drilling and grouting 20-ft. holes 4 m. apart, followed by 30-ft. holes in between and, finally, 40-ft. holes centered in the intervening 2-m. spaces. Due to the relatively high cost of cement and the low cost of labor the spacing of holes is much closer and the water-cement ratio of grout is lower (grout is thicker) than is common in American practice. The object is to save cement by limiting the grout penetration and thus confining the consolidation to only the necessary area.

Effectiveness of the grouting is now being determined by water-pressure

tests through drain holes in the foundation gallery. Water pressure of 20 psi. is maintained in the hole for 24 hr. and leakage is measured by reading a meter at intervals of 1 to 2 hr. Where leakage is too high, that is, where it is more than 0.25 gpm. or is progressively increasing, the foundation rock in the vicinity of the hole is regrouted and a new water pressure-leakage test is made.

Quantities of Material Required and Comparative Cost Per Cubic Meter for Three Types of Construction, Upper Tsing Yuan Tung Dam

Type of Construction	Quantities Per Cubic Meter						Relative Cost (%)
	Cement (bbl.)	Lime (lb.)	Sand (c.m.)	Aggregate (c.m.)	Stone Blocks (c.m.)	Labor (man-days)	
Mass concrete	1.3		0.5	1		5*	100
Ashlar with cement mortar	0.33		0.2		1	3.6*	49**
Ashlar with lime mortar		55	0.2		1	3.6*	17**

* Includes allowances for sickness, bad weather and contractor's profit.
** Includes total cost of stone blocks in place, including quarrying and dressing, transportation foundation chiseling and laying

Ashlar masonry methods

Selection of cut sandstone blocks as material with which to construct the diversion dam was made after carefully considering all available materials and equipment as well as comparative costs. The limited supply and the high cost of cement were determining factors. However, Chinese workers are highly skilled in ashlar masonry construction and for centuries have been developing their technique and methods.

The accompanying table shows the relative cost of ashlar masonry laid with lime mortar or with cement mortar, and of mass concrete on the Upper Tsing Yuan project for the month of September, 1947. These costs would have to be modified for other localities. For instance, in Nanking and Shanghai the price of labor would be about five times as great and the cost of cement would be about doubled. In tabulating costs the "price" figures are given as percentages of the highest estimates. This makes possible comparisons as of the date of the estimates and for this particular location without introducing either of two uncertainties, namely (a) the rapid and sometimes extreme fluctuations of Chinese currency and (b) the practical non-existence of U. S. dollars.

The size of the stone blocks is 0.4x 0.4x1.0 m., a size determined by the maximum weight that workers can transport and handle to advantage. The transverse section (0.4x0.4 m.) is rigidly maintained, but the length is not so critical and more tolerance is permitted. The stone is quarried and dressed to size on both banks of the river above the dam. By carefully observing the bedding planes of the sandstone and planning the procedure in advance, very large stones are reduced to blocks of the required dimensions with astonishingly small waste. Only hammers, chisels and steel wedges are used in this work.

All of this work is performed by contractors' forces at a stipulated price per cubic meter, which is adjusted twice a month in accordance with the local price of rice. The dressed blocks are transported to the damsite on tram cars, in small boats and by the workers themselves. In the last-named method usually eight workers shoulder poles from which a block is slung.

Prior to setting individual blocks, the foundation is trimmed by hand with chisels and hammers and is thoroughly cleaned by washing with water. The blocks are laid in 1:3 cement-sand mortar. The vertical joints are filled by pouring thin mortar into the spaces. Because of the relatively high cost of mortar and low cost of labor, a maximum of ¾-in. joint width is permitted. Each course is allowed to set at least 36 hours after which the top surface is again hand trimmed to smooth level. This is done to insure the proper bearing of the blocks.

Powerhouse

The power installation will consist of two units: 9,000 and 4,000 kva., respectively. The steel penstock, 3.5 m. in diameter and 160 m. long, is supported on ring girders in an open trench for 120 m. Where the penstock passes through a 40-m. tunnel, concrete backfill is used. A wye made of steel plate divides the flow between two vertical-shaft Francis turbines. Each branch is controlled by a butterfly shutoff valve.

The normal gross head available is 28 m. (92 ft.), the maximum and the minimum being respectively 110 and 87 ft. The average flow through the powerhouse will be (1,030 cfs.).

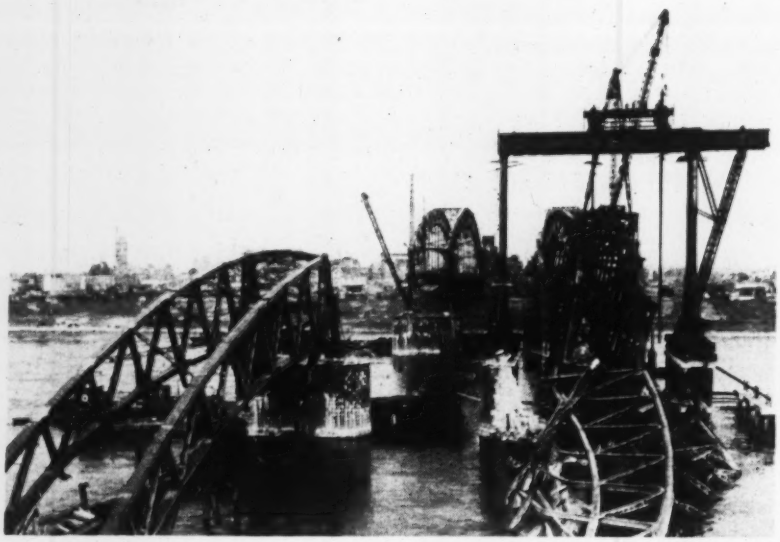
The powerhouse is unusual in that it is located underground in a space excavated in solid sandstone. This was done because the draft tubes discharge into a deep pool located immediately below the waterfall and there is no bench or shelf on which to rest the structure. A powerhouse of conventional design would have required moving its location downstream below the pool and thus considerably increasing the length of the penstock.

The concrete shell of the powerhouse was designed to withstand the external hydrostatic pressure that may reach high values in time of flood. At such times there is possibility that the structure will be overtopped, hence the watertight cover provided for the top. Another means of access is through a tunnel leading from the operation office to the generator floor. A ventilation gallery leads vitiated air away from the building to a level where there is no danger of submergence.

Excavation near the bottom of the powerhouse chamber struck a leaky stratum of shale. Exploration by drilling showed that this shale was eroded on the water side of the rock, the erosion extending into the area of the draft tubes to such an extent that it would be impossible to follow the original plan of excavation. The conventional type of cofferdam would have been too costly and almost impossible because of the extreme depth of the pool below the powerhouse. A thin arch cofferdam to be built by divers within the eroded space was therefore devised as an expedient. This arch is to be made up of burlap sacks filled with a mixture of sand and cement and is to seal off the area of the draft tubes permitting excavation in the dry.

For the past 3 years the work of the National Hydroelectric Engineering Bureau of China has been done under the guidance of Y. H. Huang, director; John S. Cotton, chief engineer, recently resigned; and Q. T. Chang, acting chief engineer. The head of the National Resources Commission is Dr. Wong Wen Hao.

One Good Bridge . . . . .



. . . From Two Wrecked Ones

Rudolf E. Neumann
Civil Engineer
Dusseldorf, Germany

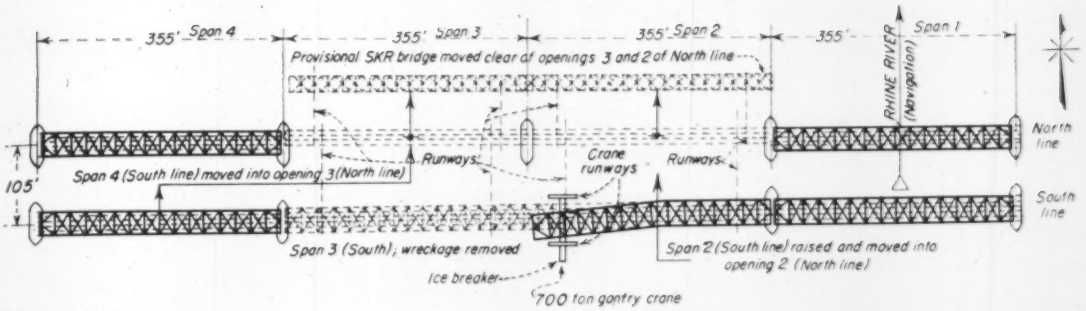
From the wreckage of two double-track railroad bridges, aligned 105 ft. apart over the Rhine River at Dusseldorf, Germany, one bridge has been reconstructed in its prewar state. The operations involved in the lifting and moving of spans weighing nearly 1,000 tons each over falsework 85 ft. high made this one of the most difficult and spectacular of German postwar reconstruction jobs. This permanent solution of the problem, completed early this year, was preceded by an interim reconstruction in 1946 in which two German SKR military truss spans were installed to provide a provisional crossing for the vital Ruhr traffic of the region. Each of the Dusseldorf bridges consisted of four 355-ft. spandrel-braced two-hinged arch spans. Prewar, the north bridge (the one which has been saved) was used for freight and the south bridge for passenger trains. As a part of the German withdrawal across the Rhine in 1945, the middle piers of both bridges were blown, dropping the two central spans of each bridge into the river. Only one of these four spans—No. 2 in the south bridge—was recoverable. This span, together with one of the undamaged spans (No. 4) of the south bridge, was used to restore the north bridge to its prewar condition. The other undamaged span of the south bridge (No. 1) is over the Rhine navigation channel, and had to be left in place since the falsework necessary to move it would have blocked shipping.

Temporary Span

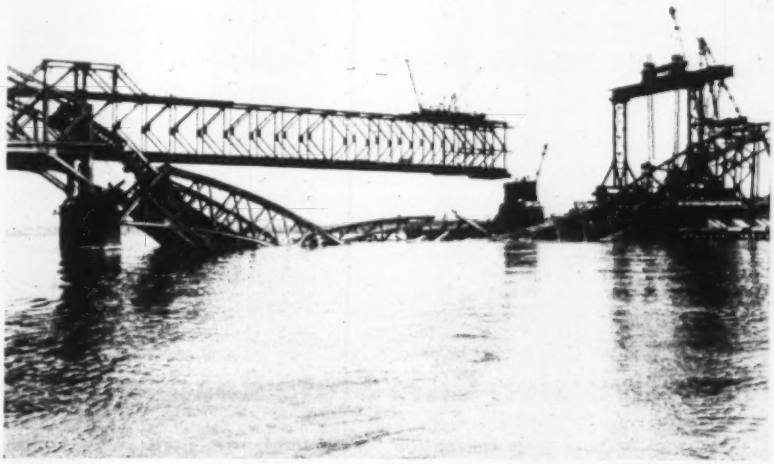
As stated above, the first operation following the war was to provide a provisional crossing until the more lengthy and difficult final solution could be worked out. This was accomplished by using a continuous truss bridge of 730 ft. total length, in two spans, to cross the opening in the north bridge. This bridge, of so-called SKR type (*ENR*, Oct. 30, 1947, vol. pp. 594-595) was made up of war material carried in stock by the German railways and several German bridge companies. Made up of standardized steel sections of fixed lengths, the bridge, in this case, was assembled by 60,000 bolts of 1-in. diameter. It was partly for this reason (since bolts could not withstand the vibration caused by railroad service for any length of time) and other factors, that the bridge was considered a temporary one.

This provisional bridge was erected by the cantilever method. One span was assembled inside of the still-existing span 4 of the north bridge to serve as a counterweight. Then the second span was cantilevered 355 ft. over the river, without falsework, to reach the central pier. The span used for a counterweight was then removed and cantilevered into place as span 2. A specially designed derrick car with two booms in front and one in the rear, traveling on the top chords of the 40-ft. high trusses, was used for erection. After three months of work, the 2300 tons of steel was in place and the north bridge was once more restored to service.

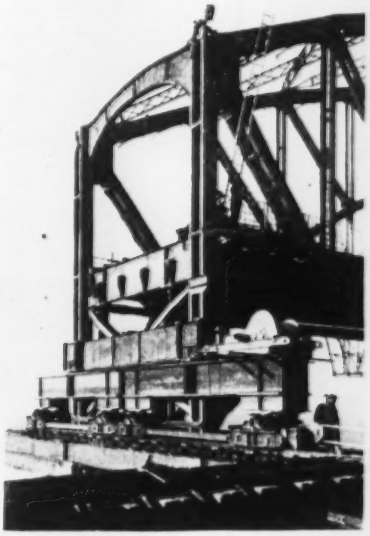
In the meantime, work looking to-



RECONSTRUCTION plan for Dusseldorf railroad crossing of the Rhine involved temporary spans in openings of north bridge, and later their replacement with two permanent spans from the south bridge.



CANTILEVER ERECTION of temporary spans for north bridge was carried out while gantry was being set up to raise the recoverable permanent arch span that had been apart of the south bridge.



RUNWAY CARRIAGES used to move arch spans of south bridge into north bridge openings.

ward the permanent reconstruction of this bridge was under way. It involved removal of the wreckage of spans 2 and 3 of the north bridge and of span 3 of the south bridge. Also included were preparations to raise span 2 of the south bridge whose west end had dropped about 50 ft. onto the river bed. To lift this sloping and tilted span, a gantry crane with a lifting capacity of 700 tons had to be erected straddling the bridge and supported on a great number of 16-in. steel piles.

To erect the crane, a working platform was built over the top chords of the sloping span, and a 20-ton, 90-ft. boom derrick set on it. The tilted structure carrying this load was about 10 ft. out of plumb and no assurance could be given concerning the end based on the river bed. Extensive statical investigations of the center of gravity under wind and water pressure and other loading conditions were made by the writer who was tremendously relieved when the operation was completed.

Within the next two weeks the 700 tons of steelwork could easily be lifted 50 ft. from the bottom of the river by hydraulic jacks mounted on top of the gantry crane and attached to bridge chords by pinned hangers.

Meanwhile, steel piles had been driven to support two lines of heavy crane girders for a runway over which the lifted span could be moved into the axis of the north bridge over a gap of 105 ft. Two specially-designed steel carriages weighing 20 tons each were placed under the suspended arch bridge while similar cars were installed beneath the corresponding span of the temporary SKR truss bridge. After the gantry crane had been removed, both the SKR span and the lifted arch span were pulled simultaneously by cables attached to hoisting drums northward to their new positions. Traffic was interrupted less than 24 hours.

The final operation involved moving arch span 4 of the south bridge into span position 3 of the north bridge. This required the construction of another runway of plate girders on piles arranged first to move the span 50 ft. north, then 355 ft. east, and finally 55 ft. north into position. The same steel carriages were used as for the previous span.

The double-track bridge of four 355-ft. spandrel-braced two-hinged arch spans is now in service. Whether or not the south bridge, which will require three entirely new spans, will be reconstructed depends upon events and the availability of steel.

Modern Plant Makes Lightweight Aggregate

The economies that may be achieved in building construction through the use of lightweight concrete are focusing increased attention not only on the development of new admixtures and aggregates but on more efficient production of the light aggregate already in use. An excellent example of this last is the new plant of the Carter-Waters Corp. near Kansas City, Mo., for the manufacture of Haydite—a selected shale that is burned and expanded in a rotary kiln, then crushed to mixture sizes.

At the new plant—on a 65-acre tract—a 75 to 100-ft. seam of shale is mined and processed to produce 8,000 cu.yd. of Haydite aggregate per month. A notable feature of the new plant is the layout of the units in a circular plan to conserve space and to concentrate the operations for efficient supervision from a central point.

Manufacturing operations begin with stripping shallow overburden so that the shale ledge can be drilled and blasted. Loaded by tractor-shovel, the shale is moved over a short haul by truck to a receiving hopper, beneath which it is reduced first to 5-in. maximum size, then to 3 in., in a pair of toothed, double-roll crushers. A belt conveyor lifts crushed material to an 800-cu. yd. storage silo to await burning in one of two parallel 6x60-ft. kilns.

Shale burned in steel kilns

Kilns are steel, lined with 6-in. refractory brick, and are oil fired. The shale is burned in 40 min. travel through the slowly rotating kiln, which is on a slight incline. Material emerges from the lower end as clinker at 2,150 deg. F. and drops to an open air storage pit where it cools for 10 days. In dry weather, heat dissipation is accelerated by sprinkling with water after the first day or two.

A guy derrick with a 2-yd. clamshell bucket lifts the cooled clinker to a storage pile or to a hopper above a jaw-type coal breaker. Mounted on a platform, this crusher reduces large clinker to 5-in. maximum size, which fall to an intermediate storage or surge silo beneath. Final crushing is in a rim grinder—a shallow, circular pan in which two steel wheels on a stationary axle ride on a rotating bottom plate. The pan sides are set ½ to ⅝ in. above the bottom. Material crushed to size by the wheels and moved to the sides by centrifugal force of the spinning bottom escapes through the peripheral opening to drop into a storage pit.

The final processing step is grading by two superimposed double-deck vibrating screens. Elevated to a screen house centered over four silos, the Haydite is separated into ½-in., ⅜-in., No. 4 and No. 8 sizes, and is stored in the 450-cu. yd. units below. Oversize from the topmost screen deck is chuted back to the rim grinder for further reduction.

Beneath the silos, graduated gates feed the desired proportion of each size to a belt for blending and for transfer to a final conveyor that moves the mixed aggregate to an adjacent rail siding for car loading.

For hollow-core building block—the most usual use for Haydite—65 percent of the two fine sizes are blended with 35 percent of the coarse ones. The resultant fineness modulus is 315. Cast of a 1 to 9 cement-Haydite mix by volume, the standard 8x8x16-in. three-cell block weigh only 25 lb., and have a minimum compressive strength of 1,000 lb. per sq. in. of gross area. The cellular composition of the expanded shale aggregate gives the block good sound absorption and heat insulation qualities, with a thermal transmission coefficient of 0.0350. The block take nails readily, and the semi-smooth surface is easily painted.

Although most of the plant's production now goes into building block, studies are under way to produce slabs, panels and other precast units.

A. W. Baldwin of the Carter-Waters firm was plant designer and engineer.

Tax Diversion Cuts State Road Mileage

Highway taxpayers in the nation have lost 95,313 miles of roads in the last 13 years because $2,038,460,000 in state highway user taxes was spent for non-highway purposes, says the National Highway Users Conference.

(Loss of mileage computed by dividing amount diverted by average cost of building a mile of highway in year of diversion)

State		*State*	
Alabama	1,147	Nevada	..
Arizona	28	New Hampshire	..
Arkansas	42	New Jersey	697
California	2,654	New Mexico	688
Colorado	429	New York	7,677
Connecticut	3	North Carolina	3,907
Delaware	381	North Dakota	779
Florida	5,573	Ohio	14,653
Georgia	4,604	Oklahoma	3,703
Idaho	..	Oregon	39
Illinois	1,769	Pennsylvania	5,786
Indiana	858	Rhode Island	292
Iowa	..	South Carolina	226
Kansas	..	South Dakota	1,922
Kentucky	1,662	Tennessee	3,476
Louisana	3,565	Texas	12,702
Maine	15	Utah	196
Maryland	124	Vermont	7
Massachusetts	509	Virginia	16
Michigan	46	Washington	612
Minnesota	153	West Virginia	..
Mississippi	15	Wisconsin	12,635
Missouri	46	Wyoming	..
Montana	12		
Nebraska	1,665	*TOTAL*	95,313

HEATING SYSTEM is in the floor in this hangar at Schenectady, N. Y., used for maintenance, testing and development.

Report on Radiant Heating

J. L. Ottenheimer
Consulting Engineer
Albany, N. Y.

Two full heating seasons have now made possible a report on performance of a radiant heating system installed in the concrete floor of the General Electric Company's unusual test hangar, located at Schenectady, N. Y.

The hangar is of thin-shell reinforced concrete arch construction, with a rise of 45 ft. It has a 170x170-ft. floor of 8-in. thick wire-mesh reinforced concrete, in which is embedded the 20,000 ft. of 1¼-in. wrought iron pipe comprising the heating system (*ENR* Aug. 22, 1946, vol. p. 254). The floor was divided into 20 panels and continuous pipe coils were used in each to insure full water circulation. The system is one of the largest in the United States.

In evaluating the performance of the heating installation, the functions carried out in the hangar must be taken into consideration. The structure houses airplanes used in testing aeronautical products in flight and is the scene of constant activity, not only in the maintenance of planes but in applying, adjusting and experimenting with new aeronautical developments prior to flight tests. It is, in reality, a fully-equipped testing laboratory.

Employees report satisfaction

This type of occupancy requires comfort temperatures for persons performing tasks of moderate to light activity. Furthermore, comfort must be obtained not only at the breath line but also at elevations of 20 to 25 ft. above the floor because of the large aircraft worked on in the hangar. It is important to study the reaction of employees to the heating installation, since figures will prove nothing if these workers are not satisfied with the space heating arrangement of their workroom.

Discussion with many of the engineers and mechanics working in and about the hangar has revealed widespread satisfaction with the heating. Many of these people were in this group when it operated at Brownsville, Tex, where moderate temperatures made heating a minor factor, and many have worked in hangars located where winter conditions are severe. The engineers were perfectly

satisfied with the heating, and the mechanics praised the comfort afforded. It is significant that to provide this comfort a breath-line temperature of only 60 deg. F. was necessary.

Effect of opening doors

One of the big problems in heating hangars is the frequent opening of the large doors, which exposes practically a whole side of the structure to the weather. When conventional heating systems are used recovery of hangar temperatures after closing the doors has been very slow. In some cases, recovery to a comfort condition requires several hours.

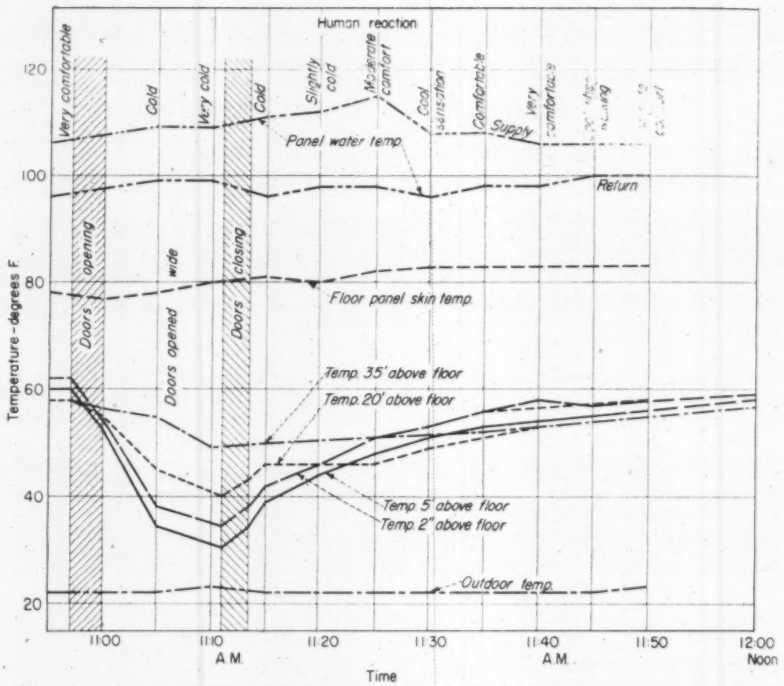
Observations at the G. E. flight test hangar on comfort conditions during opening and closing the doors are shown in the chart. It can be seen that with doors fully opened for a period of 11 min. the hangar temperature at the breath line dropped from 60 deg. F. to 31 deg. After the doors were shut, half of the temperature loss was recovered in 7½ min. and the final temperature was recovered in 50 min.

While these figures indicate a surprisingly rapid recovery, the human reaction to this recovery, as shown in the chart, is still more remarkable. The writer registered these reactions dressed in a business suit without top coat or hat. It can be seen that temperatures indicated by thermometers tell about half of a comfort story in a radiant heated building.

Air temperatures vary slightly

It is interesting to note that in most high-bay industrial buildings, temperatures at the ceiling ordinarily range from 90 deg. F. to 100 deg. to provide comfort temperatures at the breath line. In this radiant heated hangar, roof temperatures have never exceeded breath-line temperatures when the doors were closed, and the conditions at the time of the tests showed a 2-deg. lower roof temperature than that at the breath line. This factor has a considerable bearing upon economy of operation.

From the curves in the chart it also can be seen that although the temperature halfway to the roof dropped quite rapidly when the doors were opened, that at the roof did not decrease too fast. This is a matter of air stratification and is presumed to be caused by the construction and shape of the roof line. However, this



TIME-TEMPERATURE CURVES for various elevations in the hangar when the doors were opened and closed Jan. 29, 1948. Outside conditions: No wind, cloudy to light cloudy and hazy, no direct sun.

factor should not be discounted as an aid to rapid recovery after closing the doors. This characteristic might be termed reverse "lease-lend" in Btu.

The curves show the skin temperature of the floor panels to be about 80 deg. F. and the air temperature 2 in. above the floor to be 62 deg.—only 2 deg. above the breath-line temperature. This rapid decrease in temperature immediately above the floor is an indication of the large portion of comfort attributable to radiant energy.

Costs compared

In this accounting-minded world, there must be some dollar-and-cents justification for installing a radiant heating system. To this end, it might be interesting to refer to the accurate fuel consumption records and weather reports that form a basis for determining cost of using radiant heating in the flight test hangar.

The heating season from Nov. 1, 1946, to May 1, 1947, has been selected as the period for study. While this heating season was not as severe as normal, there were extended periods of low outside temperatures.

By comparison with conventional heating, this radiant heating system afforded a fuel saving of 22.7 percent over the entire heating season. The same calculations were repeated for the month of February, 1947, for which the mean temperature was 21.4 deg. F., making it the most severe month of the heating season. Compared with conventional heating, the saving proved to be 26 percent. This apparently indicates that the more severe the outside condition, the greater the economy that can be realized with a radiant heating system.

These comparative figures were prepared with empirical formulas that are commonly used in the profession. It is believed that due to certain practical factors affected by the size and shape of the structure, these formulas are very conservative.

From this report on the operation of a large radiant heating system, it can be seen that comfort can be obtained at lower ambient interior temperatures with radiant heating than with conventional types. In view of the inherent increased interior humidity with radiant heating, improved production for industrial installations may result and a more healthful condition for all applications is provided. Furthermore, the sizable savings in operation certainly justify the increased cost of installation above that of conventional systems.

Notes on Legal Decisions

Summaries of decisions relating to construction prepared by I. Vernon Werbin, counselor at law and engineer, New York

Partial Payments

Failure to make the installment payments called for by the contract may constitute a breach of the contract and authorize the other party to abandon the work. But the law does not infer such a consequence from the ordinary obligation to pay money at a particular time or upon the completion of a specified portion of the work[1].

A contract requiring the owner to make weekly payments to the contractor to enable him to carry on the work, makes such payments a condition precedent to performance and a failure to pay constitutes a breach[2].

Ordinarily in a contract calling for labor and materials over a long time and involving large expenditures, payment at intervals during the progress of the work is stipulated. This is deemed so material that a substantial failure to pay would justify the contractor in declining to proceed with the work[3].

(1) Big Boy Drilling Corporation v. Etheridge, et al., 111 P. 2d, 953.
(2) White v. Livingston, 69 App. Div. 361, affd. 174 N.Y. 538.
(3) Guerini Stone Co. v. P. J. Carlin Const. Co., 248 U.S., 334 365.' L.ed 275;
Thomas v. Stewart, 132 N.Y. 580.

Arbitrating Disputes

Construction contracts very often contain provisions that all disputes arising out of the contract will be submitted to arbitration. Such provisions have often been held to be unenforceable as they tend to usurp the jurisdiction of the courts[1]. However, most states have enacted statutes authorizing the settling of disputes by arbitration. These statutes generally provide for the obtaining of a court order to confirm the report of the referee and also give the objecting party an opportunity to file objections and be heard.

A contract provision "that all disputes that may arise out of this contract or out of the performance of the work hereunder, shall be submitted to arbitration at the choice of either party thereto" is broad enough to cover claims for extra work and for damages for breach of contract[2].

It is an established principle in settlement of disputes by arbitration that "all reasonable intendments and presumptions are indulged in to support the awards. . . . The general principle is subject to the qualifications that the award may be set aside for palpable error of fact, like a miscalculation of figures or mistake, of that nature. It may also be set aside for error of law, when the question of law is stated on the face of the award, and it appears that the arbitrators meant to decide according to the law but did not[3]."

Where the agreement to arbitrate is limited to certain specified matters the right to arbitrate will not be extended beyond the specified items[4].

(1) Meacham v. Jamestown, F. & C. R. R., 211 N.Y. 346.
(2) Tarello v. John A. Johnson Contracting Corporation, 50 N.Y.S. (2d) 212.
(3) Fudickar v. Guardian Mutual Life Ins. Co., 62 N.Y. 392.
(4) Lew Morris Demolition Co. Inc. v. George F. Driscoll, 273 N.Y. 330.

Written Orders for Extra Work

Where a contract provides that all orders for extra work must be in writing, an oral order is not sufficient [1]. This is particularly true where the contract is with some branch of the government. The contract provision is notice to the contractor of the limited authority of the architect or engineer to order extra work—that is, they have the power to do this only by a written order[2]. The requirement for a written order for extra work being part of the contract, the architect or engineer has no power to waive it [3].

Where a private owner has knowledge that the contractor is proceeding with work on an oral order and does not interpose any objection, the owner may be deemed to have waived the requirement for a written order for the extra work [4].

Where the contract provides that there shall be no charge for extra work unless by written agreement, recovery cannot be had. The law is clear that the defendant is not liable on *quantum meruit* or upon the contract unless the changes or extras were as authorized by the contract [5].

In some cases where the owner orally orders extra work and agrees on the price to be paid, a recovery is allowed. This is on the theory of a separate oral contract covering the work in question[6].

(1) United States v. Cunningham, 125 F. (2d) 28.
(2) Langley v. Rouss, 185 N.Y. 201.
(3) Woodruff v. Rochester & Pittsburgh R.R. Co., 108 N.Y. 39.
(4) Keahon Bros., Inc. v. Blank, et al., 292 N.Y.S. 257, 161 Misc. 874.
(5) Blair v. United States, 66 F.Supp. 405.
(6) Teer v. George A. Fuller Co., 30 F (2d) 30.

Cities Set Annexation Record

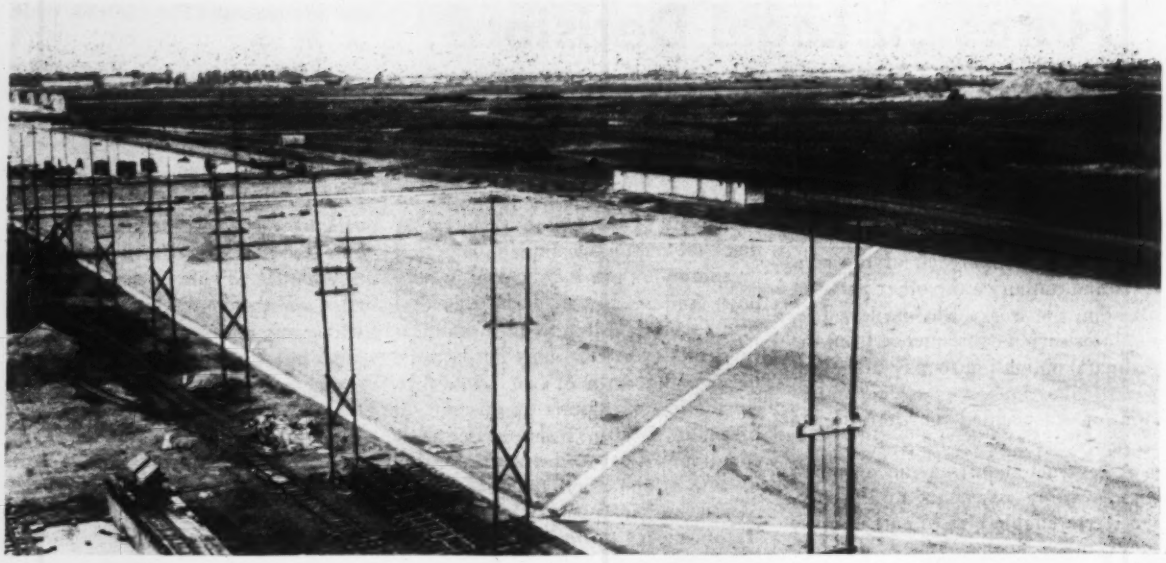
Cities are straining to keep up with urban expansion by annexing outlying territory, the International City Managers' Association reports. Last year a record total of 298 U. S. municipalities extended corporate limits by means of annexation.

This marks a 15 percent increase over the number of cities adding land in 1946, when 259 municipalities annexed some suburban territory. Of last year's annexation, 170 were by cities over 10,000 population. The remaining 128 were by cities between 5,000 and 10,000.

"Cities strive to annex outlying territory in order to equalize local tax rates, provide uniform public services, and permit long-range community planning on a broader scale," according to the report. "Suburbs usually resist annexation on the grounds that it may mean higher tax rates for their residents."

Most territory annexed in 1947 was Dallas' addition of 6,477 acres. New Braunfels, Tex., ranked second with 5,400 acres. In the same state, Texas City added 4,083 acres, Waco added 3,000, Amarillo 2,560 and El Paso 2,200 acres.

Third in the list of area annexed was Pine Bluff, Ark., with 5,000 acres added. Rapid City, S. D., annexed 4,000 acres. In Virginia, Martinsville, Portsmouth and Staunton annexed 3,840, 3,600 and 3,593 acres, respectively. Greensville, S. C., and Beckley, W. Va., each annexed 2,560 acres.



At Orly airfield, near Paris, a thin, durable slab strong enough for the heaviest planes is sought through . . . . . .

Prestressed Concrete for Runways

McGraw-Hill World News

To meet the challenge to engineering skill presented by the ever-increasing weight of bomber and transport planes, French engineers recently built the first prestressed concrete runway in the world. The strip is at Orly Field, near Paris, incorporated in a runway of ordinary concrete, for comparison of strength and serviceability.

Eugene Freyssinet, head of the Technical Society for the Utilization of Prestressing, designed and patented the Orly strip.

"They aren't building big enough planes yet to give my strip a workout," Freyssinet boasts. "But they soon will, and then we'll see. The strip can handle planes nearly twice as heavy as any taking off today."

Freyssinet knows what he's talking about. He pioneered prestressed concrete; likes to say of himself "I am prestressed concrete!" He emphasizes that the Orly job was experimental.

"It's just a first step," he says. "When we were called in on the job we were given no paving machines, poor cement and bad gravel. We never again will do a strip the way we did that one. We tackled it to test our theories. We learned a lot and proved the importance of prestressed runways once and for all. The strip performed better than we had hoped —much better than ordinary strips."

Advantages of prestressing

Here are the claims made with respect to the relative merits of the prestressed and ordinary section of the Orly runway:

1. The prestressed section can carry loads 15 times greater than the same thickness of ordinary section and give the same factor of safety. Freyssinet states that conventional runways are taxed to the limit of their strength by the heaviest types of existing planes and have no factor of safety to spare. His prestressed runway, he claims, could carry planes triple the weight of any yet built with a safety factor of two to three.

2. Although the prestressed section is only 6⅜ in. thick, its strength is at least equal to that of a conventional strip 24 in. thick.

3. Because the new strip is thin, stresses due to temperature differences between surfaces are low.

4. Articulating the strip practically eliminates warping due to temperature changes normally encountered.

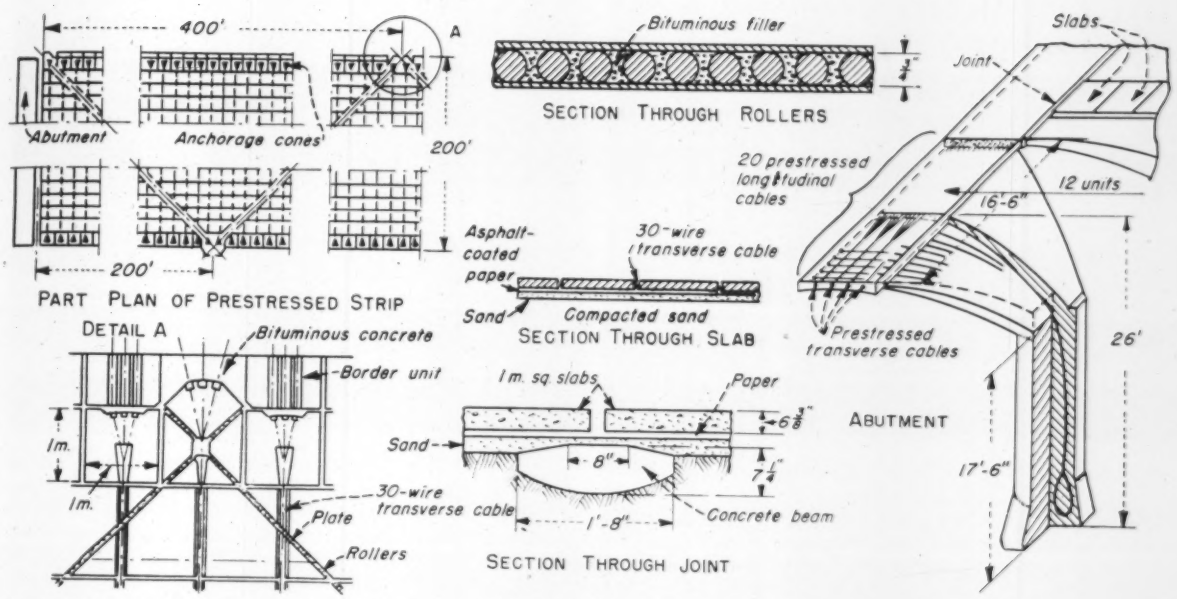
5. Cracking under heavy loads may occur, and, in fact, is desired rather than feared, since cracks will increase the flexibility, enabling full use of the support of the foundation without large bending moments. The tension in the cables automatically closes fissures completely when the load is removed.

Freyssinet feels that these advantages over ordinary landing strips are particularly important these days because jet planes burn up asphalt runways with their exhausts. This, he thinks, leaves prestressed concrete as the only good answer to the problem of tougher runways for bigger planes.

Rollers placed in joints

The Orly prestressed runway is 1,400 ft. long, 200 ft. wide and 6⅜ in. thick, made up of one-meter square precast concrete blocks. Precasting was adopted because of the lack of heavy mechanical equipment, the cheapness of French labor and the shortness of the strip. Concrete for the slabs was 1: 2.2: 2.6, using 3½ gal. of water per bag of cement.

The slabs were laid on a 14-in.



DETAILS OF CONSTRUCTION. Roller-bearing joints placed at 45 deg. with the strip axis permit two-way prestressing using only the transverse cables between the 1-meter square precast concrete slabs comprising the runway. Abutments at the ends of the strip provide longitudinal restraint. They were prestressed in two directions.

deep consolidated foundation with a maximum bearing strength of 100 psi. This foundation was covered with 2 in. of fine sand and topped with asphalt paper.

The most ingenious feature is the joints, which were formed at 45 deg. with the longitudinal axis of the strip, dividing it into six right-angle isoceles triangles, with 400 ft. hypotenuses, and two isoceles triangles at the ends, with 200-ft. arms. The joints were incorporated so that it would be possible to obtain a two-way prestress with cables laid in only one direction, transversely.

A necessary adjunct was a concrete abutment placed at either end of the strip. In the prestressing operation, when the cables were stressed, the resulting lateral compression was translated into longitudinal compression by the action of the joints. This compression then was resisted by the abutments, with the result that the longitudinal and lateral stresses were equalized to within one percent.

In the same manner, stresses due to temperature changes are distributed uniformly throughout the runway, increasing or decreasing the prestress tension with negligible warping of the strip.

The joints were built in such a way that the edges of the triangular sections slide past each other horizontally with a minimum of friction. The edges bear on vertical ¾-in. dia. steel rollers set about 1 in. c. to c. on a 7-in. thick, 20-in. wide, continuous concrete footing. Friction was reduced further by lining the edges of the joint with steel sheet, which was placed while the concrete was still wet. Interstices between the rollers were packed with asphalt.

Steel jacked to high stress

The transverse cables were laid between the precast blocks. They consisted of 30 parallel ¼-in. dia. steel wires, with an average ultimate tensile strength of 220,000 psi. Previously, they had been dipped in asphalt and wrapped in heavy building paper. At the edge of the strip, the 30-wire cables were separated into three strands, which were anchored by pinching them between Freyssinet-patented interlocking cones.

After the cables were placed, mortar was cast in the joints between slabs. Lateral joints were packed full, but longitudinal joints were only filled up to the bottom of the cables.

The cables were tightened in four steps. The 240 westernmost cables were tightened first to a tension of 78,000 psi; then the 180 easternmost were brought to the same tension and finally, the remaining cables in the center were stressed. As a last step, the cables were jacked to a tension of 128,000 psi., imparting a uniform stress of 4,750 psi. to the concrete.

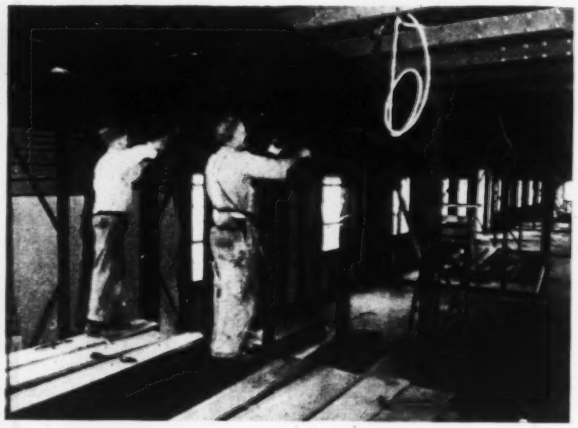
The two abutments at either end of the strip are made of concrete prestressed both laterally and longitudinally. They are 200 ft. long, running the full width of the runway, 6 ft. wide and of varying thickness. They are anchored by 12 concrete buttresses, acting in tension, curving under the runway 26 ft. deep.

Prestressing buttress cables perpendicular to the axis of the strip are made fast with anchorage cones. Cables parallel to the axis of the runway are anchored at the bottom of the buttresses in concrete injected under force.

When the runway was prestressed, the pressure against the abutments acted against the longitudinal prestressing cables in the buttreses, which exert a counterthrust that assures maintenance of stress in the runway itself. With a 4,750-psi. prestress on the concrete, the longitudinal pressure on the abutments is 17.5 tons per linear foot.

Freyssinet points out that he still has two variables to play with in improving his method: (1) He can more than double the prestress tension without increasing the thickness of the concrete, and (2) He can thicken his concrete without too much loss of elasticity or too great temperature variations between the upper and lower surfaces.

QUICK ERECTION of building frames, facilitated by light-gage prefabricated trusses and studs and asbestos-cement insulation board is put to good use on the campus at Pennsylvania State College to . . .



PROVIDE HOUSING for students and faculty in dormatories and two-family houses on the college campus. Inside work, such as lathing, plumbing and wiring can proceed as soon as the frame is enclosed.

Fast Work on Student Housing

Last year Pennsylvania State College faced the problem of quickly providing additional housing for 1,100 students. There appeared to be no time to build conventional, permanent dormitories, estimated to take 12 to 18 months because of shortages in materials and skilled labor.

Then a better answer than makeshift war surplus buildings came from a Pittsburgh fabricator-erector. This firm submitted a bid on its own design to put up sound, comfortable dormitory units at a price that compared favorably with the cost of re-erected, donated Army surplus buildings. The design would supply most of the features of conventional dormitories, erection would be quick, and cost would be about $600 per student, as against $6,000 for traditional construction.

Low cost was essential to permit minimum rental charges to students. The buildings offered another advantage that the college wanted: full salvage for conversion to other uses.

The college snapped up the offer, and the contractor went to work. On schedule, he was able to turn over the keys to the completed buildings in the allotted period of four to five months —about one-fourth of the time needed to duplicate existing permanent dormitories on the campus. In exactly 105 days after first framing was set, the on-site working force erected and finished, ready for living, 25 single-story buildings, 24x168 ft. in plan. Each contained 20 double and 4 single rooms on two sides of a longitudinal 4-ft. corridor, with a lounge and lavatory in the center of the structure.

Framing and exterior easy to erect

Simplified, standardized design made possible the quick erection. All parts for the steel frames, siding, roof deck, sash and doors came to the job completely fabricated. Tested materials and assembly features assured sound durable construction with reasonably long life expectancy and low maintenance cost. No furnaces were needed, since steam is piped into the buildings from the main college plant.

Building sites were laid out and graded by the college. Concrete block walls then were built around the reinforced concrete floor of each building, and the erectors set up on each wall and bolted together a steel frame of light-gage members, having studs and roof trusses on 2-ft. centers. The trusses were pre-assembled on the job.

The crews attached story-height panel siding of insulating board 1½ in. thick to the walls. The board consisted of a pressed fiber core faced on both sides with ¼-in. asbestos-cement board. Steel battens bolted to the steel studs locked the siding to the frame.

Similar panels—wire-tied to the top chord members of the trusses—formed the roof decks of the buildings. Close spacing of the trusses makes the 1½-in. board adequate for snow loads on the gable roofs, which are pitched 6 in. in 12 in. On top of the insulation, roofers placed 15-lb. felt and 210-lb. asphalt shingles.

Inside walls and ceilings are metal lath and plaster. All windows are steel sash with wood surrounds. Floors are covered with asphalt tile.

Foundation walls and slab

Concrete footings for the foundation walls were placed below frost line. On a building site previously graded, a backhoe with bucket built to footing width dug the wall trenches, completing the 380 ft. of trench for the building in a day. Footing concrete was placed without forms in the bottom of the trench, and the block walls were started on the third day thereafter. The block walls were built up to expose one course above finished earth grade.

After rough plumbing had been laid, a local grade of crushed limestone was placed and rolled to 4-in. depth on the finished earth grade as a base for a 4-in. concrete slab reinforced with 6x6-in. 10-ga. wire mesh. The upper half of this slab overlapped the inner top of the block wall. Sidewalk forms placed on the outer top surface of the wall shaped the edge of this concrete and, when stripped, left a ledge for the base of the siding panels to fit into.

A gasoline-powered screed riding on the forms struck off the 4-in. concrete, and gasoline-driven rotating finishing machines finished the surface. Before the concrete set, anchor bolts were inserted adjacent to the edge forms for attaching the metal base plates of the steel frame.

Steel frame assembly

Base plates and studs of the steel frame are formed channels, and the trusses are made up of channels and angles. All framing came knocked down from the fabricating plant. Truss members were delivered first, and truss assembly started before any concrete floor slabs had been laid.

Trusses were hand-assembled on six jigs in a special area near the site. Air wrenches tightened the bolted connections. Completed trusses—there were 2,125 of them for the 25 buildings—were turned out at a rate of one a minute.

To start the frame for a building, the erectors first bolted the steel base plates to the slab. Once these plates were squared up in final location, no additional layout, measuring or plumbing was necessary in erecting the rest of the frame. All framing members came to the job detailed, cut to size and fabricated.

The erection crew set the complete wall framing—studs, door and window frames, and eave plates—with all connections bolted loose. Two-level rolling scaffolds, traveling on the floor slab, then started from both ends of the building, working toward the center. Workmen on the scaffolds erected the trusses—weighing only 90 lb. each—without any mechanical lifting equipment.

Another crew followed with air tools to tighten all connections. A total erection force of 16 men completed the framing of a 24x168-ft. building in 8 hours, including the hauling of trusses from storage and the tightening of all bolts.

Next came the steel sash. These had been delivered to a local lumber yard where they were assembled in a wood surrounds previously made to the contractor's drawings, and the wood then was primed. Trucks delivered the sash from the yard to the buildings, and the sash was set directly from the trucks, eliminating storage and handling.

Prefabricated copper flashing that required no cutting or forming was installed at the wall base, eaves, and gables, and over windows and doors. A calking tape laid over the base flashing formed a sealed base for the exterior siding to rest on.

Siding factory-cut to fit

The 2-ft. stud and truss spacing accommodated stock of 4-ft. width (actually 3 ft. 11¾ in.) of insulation board used for siding and roof deck. Wall panels were in 8-ft. lengths, and roof panels in two lengths of about 8 and 6 ft. to cover the 14 ft. from ridge to eave.

Siding was factory cut to take care of window and door openings. In the design stage, the contractor detailed every piece of siding and roof deck. A cutting list and bill of material were sent to the manufacturer of the board, who cut all items to size at the plant, sealed all edges against moisture penetration and shipped by rail, two buildings to a car.

At the job, much of the siding and roof deck went into place directly from the contractor's trucks that hauled the sheets from a local freight siding, again eliminating both storage and handling. Special steel members—part of the frame—held the roof panels in place until the deck was fastened by heavy tiewires to the trusses.

Interior finish

Before lathing was started, electricians placed the overhead rough wiring and hung cables for wall switch and outlet boxes to be wired later to the lath. As a plaster base for the ceiling, ⅜-in. ribbed lath was fastened to the bottom chords of the trusses. Interior metal door jambs were then installed. Sidewalls were lathed, and steel channel runners and lath were placed for the 2-in. solid plaster partitions.

For wind bracing, steel-frame hollow partitions were built every 24 ft. across the structure from the sidewalls to the center corridor.

Plasterers applied 12 to 15 tons of machine-mixed plaster each day. To counteract high humidity and to speed drying, the contractor used portable gasoline-burning heaters equipped with blowers that forced 750,000 Btu.'s per hour of warm air through canvas ducts into a building.

All inside doors were stored in one of the unplastered buildings. Hanging of the doors was a quick, simple job. Jambs had been prefabricated by the manufacturer with the hinges welded to them. On the job, doors were prepared for hanging by making the cutouts for hinges, latches and night latches with jigs, thus eliminating individual fitting of the doors.

Except for college students hired to erect framing during the summer, the job was 100 percent manned by regular union workers. The AFL carpenters' union, recognizing the shortage of manpower, permitted the contractor to engage students for frame erection.

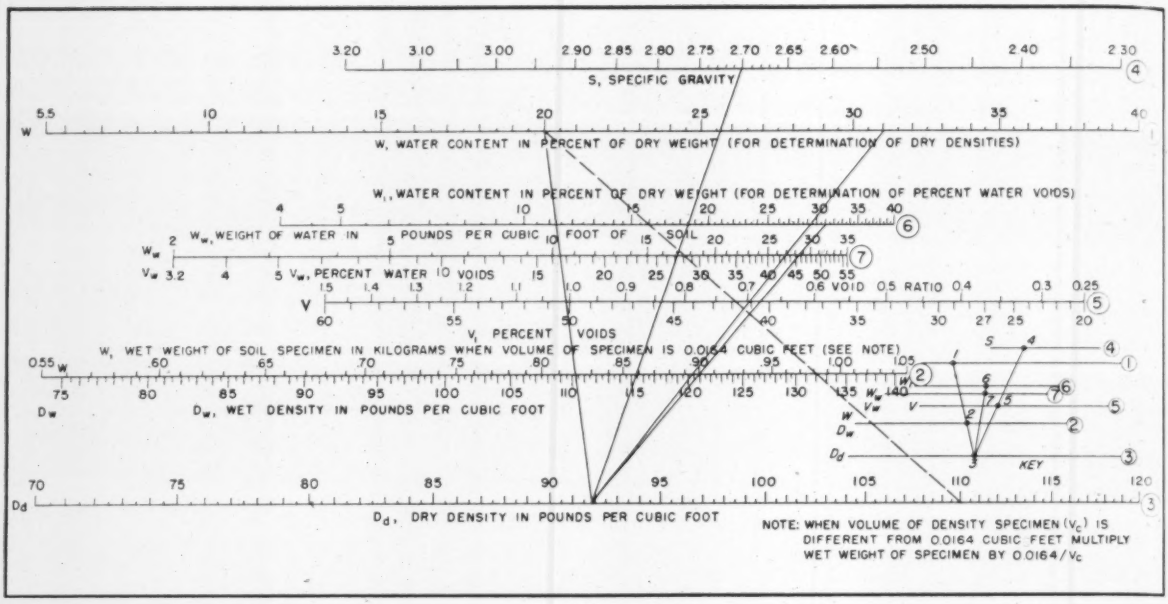
College orders more of same

Before the contractor had completed the dormitories, the college decided that the steel-frame and insulating-board construction was the answer to another problem: Housing units at reasonable rent for the families of additional faculty members. Designs were submitted and accepted, and the contractor built 76 family units—one- and two-bedroom apartments—in double and quadruple houses.

Basic construction of these houses was the same, except that casement-type steel sash was used and the exterior was dressed up with hoods over the doors and trelliswork over the windows. With oil-fired forced-air heating furnace, hot water heater, electric range and refrigerator, the basic cost was about $4,850 for a one-bedroom unit and $5,980 for a two-bedroom. This does not include site preparation or finish grading.

The dormitories and houses for Pennsylvania State College was designed, furnished and erected by the Steel-Bilt Construction Co., Pittsburgh, Pa. R. L. Tucker is president of the company, and Ernest J. Mihalyi has charge of design and engineering. Celotex Corp. furnished the asbestos-cement insulation board.

Subcontractors were: excavation and foundations, W. K. and S. H. McPherson, Edgeworth, Pa.; plumbing, Theodore Deeley, Mt. Lebanon, Pa.; and five Pittsburgh firms for the remaining trades—plastering, McNulty Brothers Co.; roofing and sheet metal, Limbach Co.; painting, John Dewar Co.; flooring, Standard Floor Co.; electrical, C. W. Carter Electrical Construction Co.


S, SPECIFIC GRAVITY
W, WATER CONTENT IN PERCENT OF DRY WEIGHT (FOR DETERMINATION OF DRY DENSITIES)
W1, WATER CONTENT IN PERCENT OF DRY WEIGHT (FOR DETERMINATION OF PERCENT WATER VOIDS)
Ww, WEIGHT OF WATER IN POUNDS PER CUBIC FOOT OF SOIL
Vw, PERCENT WATER VOIDS
V, VOID RATIO
V1, PERCENT VOIDS
W, WET WEIGHT OF SOIL SPECIMEN IN KILOGRAMS WHEN VOLUME OF SPECIMEN IS 0.0164 CUBIC FEET (SEE NOTE)
Dw, WET DENSITY IN POUNDS PER CUBIC FOOT
Dd, DRY DENSITY IN POUNDS PER CUBIC FOOT
KEY
NOTE: WHEN VOLUME OF DENSITY SPECIMEN (Vc) IS DIFFERENT FROM 0.0164 CUBIC FEET MULTIPLY WET WEIGHT OF SPECIMEN BY 0.0164/Vc

Soil Properties Computed by Nomograph

Harry Leibovich
Soil Mechanics Engineer, Upper Mississippi Valley Division
Corps of Engineers
St. Louis, Mo.

Quick, simple determination of soil properties is now feasible with a nomograph. Only a few laboratory measurements, a straightedge and the single graph are required for computations.

Such speedy calculation of unit weights and related soil properties is desirable in the control of earth fills for dams, levees, highways, etc. Previously (*ENR*, Sept. 18, 1947, vol. p. 394) these were made with a set of two graphs. The single chart (nomograph) is now available for use with soils having specific gravities ranging from 2.3 to 3.2 and water contents ranging from 5.5 percent to 40 percent. This range of specific gravities covers practically all types of soils to be found in the lower Mississippi Valley, but similar charts may be prepared for other soils.

The chart key shows the various determinations that may be made by connecting any two known appropriate points with a straightedge and reading the desired value of the unknown on the line designated by the key. The key numbers are the same as the circled identification numbers on corresponding scales of the chart. The combinations of variables contained in the chart are:

Water content (1), wet density (2), and dry density (3);

Specific gravity (4), total percent voids (porosity) or void ratio (5), and dry density (3); and

Water content (6), weight of water per unit volume of soil mass or percent voids occupied by water (7), and dry density of soil (3).

In design computations it is frequently necessary to determine saturated and submerged weights of soils.

Examples of use

For example, supposing it is desired to determine the saturated and submerged unit weights of the foundation soil immediately under a footing of a large building. A soil density sample is obtained in a sampler having an inside diameter and length of 3 in. (vol. = 0.0164 cu. ft.). Wet weight of the sample is .820 kg. The "wet" and "dry" weights of a water-content specimen taken from the sample are 132.0 and 110.0 g., respectively. Average specific gravity of the solid particles of the soil, as determined by laboratory test, is 2.70. The water content [20 percent on scale (1)] is indicated by a straight line passing through the points 132.0 and 110.0 on the density scales (2) and (3), respectively.

A straight line through 20.0 percent on scale (1) and 0.820 kg. on scale (2) shows the dry density to be 91.8 lb. per cu. ft. on scale (3). The total percent voids [45.6 percent on scale (5)] is determined by a straight line through 2.70 sp. gr. on scale (4) and 91.8 lb. per cu. ft. on scale (3). Water content at saturation [31.1 percent on scale (6)] is given by a straight line passing through 91.8 lb. per cu. ft. on scale (3) and 45.6 percent water voids on scale (7). A line through 31.1 percent on scale (1) and 91.8 lb. per cu. ft. on scale (3) defines the saturated unit weight as 120.4 lb. per cu. ft. on density scale (2). Submerged unit weight of the soil is 120.4 − 62.4 = 58.0 lb. per cu. ft.

Other soil variables

The following are examples of determinations of dependent soil vari-

ables that may be made from the chart in conjunction with simple arithmetic computations:

a. After the percent water voids, Vw, and the total percent voids, V, have been determined from the chart, the percent saturation, G, may be determined by division:

$$G = 100\ Vw/V.$$

b. For partially saturated soils, the percent air voids, V_A, may be determined by subtraction:

$$V_A = V - Vw.$$

c. The "percent solids by volume" may be determined by subtraction: "percent solids" = 100 — V.

Some Practical Uses

One of the practical uses of the chart in connection with the control of rolled earth fill is determination of the amount of water necessary to sprinkle on a loose layer of relatively dry fill before rolling.

For example: An inspector uses a sampler having inside diameter and length of 6 in. (vol. = 0.0982 cu. ft.), and obtains a loose fill density sample having a wet weight of 4.41 kg. and a moisture content (determined by test) of 10.0 percent of the dry weight of soil. He also determines that the average thickness of the loose fill layer before rolling is 8 in. Previous laboratory tests indicated that for the type of soil sampled (slightly cohesive silty soil), the optimum water content was 17.0 percent of the dry weight of soil for the amount of compaction desired. (It is assumed for this particular job that 0.5 percent moisture will be lost by evaporation during the time of sprinkling, mixing and rolling.) In accordance with the note on the nomograph, adjusted wet weight of soil specimen is 4.41 x 0.0164/0.0982 = .736 kg.

A straight edge is rotated about the point 0.736 on the "wet weight of soil specimen" scale (2), until the straight edge contacts 10.0 percent on the upper "water content" scale (1). The dry density of loose fill (90.0 lbs. per cu. ft.) is read on the "dry density" scale (3) near the bottom of the chart. The straight edge is then rotated about the 90.0 lb. per cu. ft. dry density point until it contacts 10.0 percent on the lower "water content" scale (6) and the weight of water contained in a cubic foot of the loose fill (9.0 pounds) is read on scale (7). The total amount of water desired in a cubic foot of the loose fill is then determined by rotating the straight edge about the 90.0 dry density point until it makes contact with 17.5 percent on the lower "water content" scale (6), and reading 15.7 on the "weight of water" scale (7). The amount of water to be added per 100 square feet of fill is:

Water to add = (15.7 — 9.0)
(8 in/12 in × 100)
= 447 pounds/square
or 53.5 gallons/square.

The advantages of being able to solve such problems with single charts are readily apparent.

See Industrial Dispersion Pushing New Public Works

Dispersion of industry as a strategic safeguard against possible enemy attack calls for concurrent provision of essential public works and utilities. James W. Follin, assistant administrator, Federal Works Agency, stresses this interdependence of industry, its employees' communities, and public services necessary to both, in an article that appeared in the August issue of *Public Construction*, the agency's monthly periodical.

Mr. Follin is the official liaison between FWA and the National Security Resources Board in the development of its policies on strategic relocation of industry and government. The July 22 report of NSRB on "National Security Factors in Industrial Location" stated as a basic conclusion that dispersion of industry is vital to the national defense.

NSRB was created by the National Security Act of 1947. The law charged it with advising "the President concerning the coordination of military, industrial and civilian mobilization." As one of its duties, the act said the board shall give advice on "the strategic relocation of industries, services, government, and economic activities—essential to the nation's security."

Most practical solution

Dispersion, the NSRB report said, is considered the most practical solution to the problem of strategic location. The solution, it declared, must reflect a judicious balance between economic feasibility and reasonable strategic security. Underground installations, partly because of higher cost, were not considered practical except for special applications.

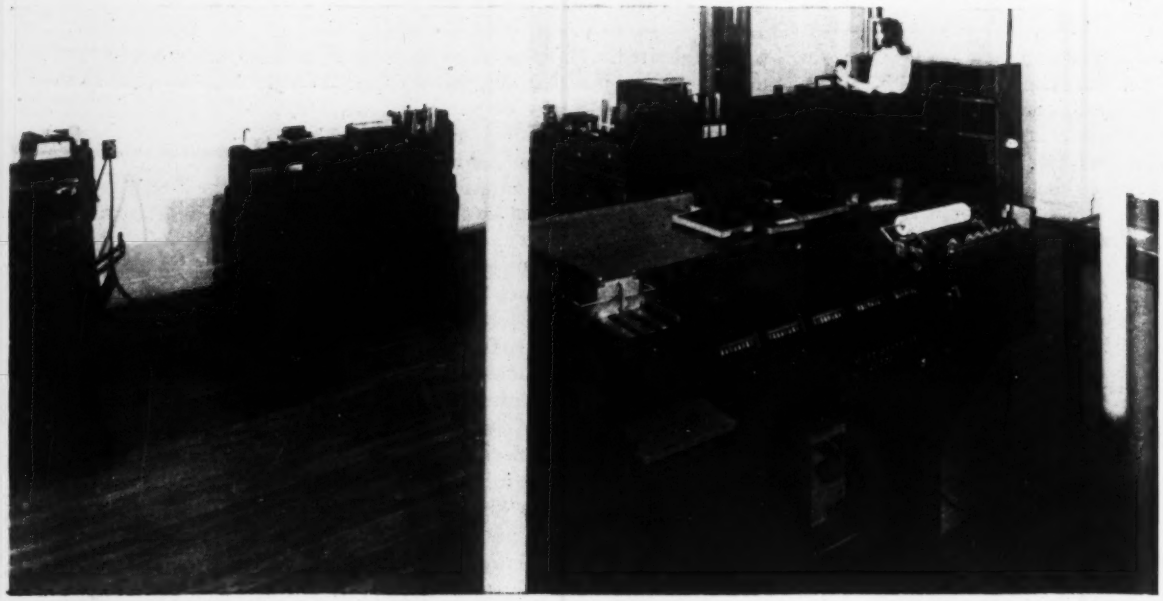
For any industry or single manufacturer, a dispersion program must fit into long-range planning, the NSRB report declared. The important thing, the report said, is to do the planning now to make a start toward dispersion when expansion or relocation of facilities becomes advisable to meet the demands of the business.

Because of the great cost of attacks by atom bombs or other mass-destruction weapons, the security board felt that industries—other than highly critical plants—would be reasonably secure if located in concentrations of less than 5 square miles and less than 50,000 population, separated by some 10 miles of open country from other communities. The same sort of thinking, Mr. Follin implies, can be applied to dispersion of government departments.

Facilities follow industry

Discussing the board's report, Mr. Follin makes the point that public facilities and services—highways, water supply, sewers, police and fire protection, shopping centers, schools and hospitals—are necessary to the placing of industry in new locations, whether they be added to existing small towns or installed in new communities. In part, he says, the problems are similar to those overcome in providing emergency public works during the late war, but they present in addition new difficulties for which no easy solutions appear available.

Public works officials are immediately concerned with proposals for industrial dispersion, Mr. Follin concludes. These officials know that public works are essential to the production process; they recognize that public construction must go forward with private plant construction in any orderly program.



A SECTION OF THE ENGINEERING OFFICE OF THE FUTURE may look like this view of the Watson Scientific Computing Laboratory at Columbia University, in which . . .

Earthquake Calculations Are Made By Punched Card Machines

The Watson Scientific Computing Laboratory at Columbia University has undertaken to execute a comprehensive numeral analysis of the acceleration records produced by the strong-motion seismographs of the U. S. Coast and Geodetic Survey during the Southern California earthquake of May 18, 1940. Using automatic punched card machinery furnished by the International Business Machines Corp., the work is designed to calculate the stresses set up in simple structures subjected to the ground motion that actually took place during the earthquake.

According to Edward C. Robison, formerly of the Coast and Geodetic Survey, who arranged for the study to be undertaken, it differs from previous work in that the entire calculation centers around the use of numerical values rather than the use of elastic models shaken or otherwise actuated by a cam cut in the shape of the earthquake record.

For a period of about thirty seconds, three records were produced by the three-component accelerographs located in El Centro, Calif., two representing the horizontal acceleration in the north-south and east-west directions, and the third the vertical acceleration. The U. S. Coast and Geodetic Survey, by means of a special magnifying device constructed shortly after the records were obtained, has read off the "ordinates," or values of the recorded acceleration, at equi-distant intervals of time about 1/20 sec. apart.

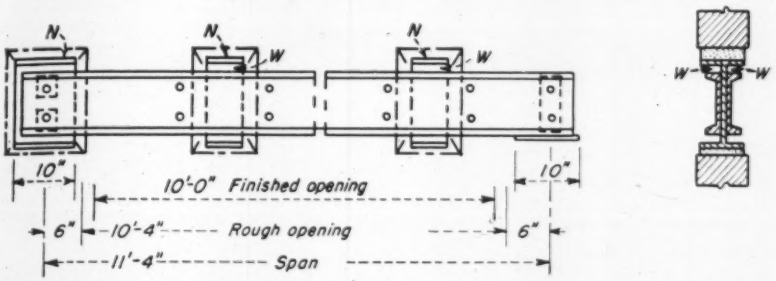
Specifically, 735 values were read off one of the horizontal records, and 750 from the second. These values were used to calculate the velocity and displacement of the ground. The results, together with copies of the original records, and a comprehensive description of the effects of the earthquake, have been published in the form of a special publication written by Frank Neumann, and copies may be had from the survey.

In the work undertaken by the Watson Laboratory, these 1,485 values form the data for a long series of calculations performed automatically by the special machinery. The punched cards used are exactly the same as those widely employed in the modern business world. The ground acceleration readings are transferred to cards by manual operation of a card punching machine. Other data (period of the structure etc.) are added, and each card is duplicated to multiply each value into several fields, covering the "frequency spectrum" used in seismic calculations. The basis for the values used in these stresses is usually percentage of gravity. Equipment used on this work turns out 4,000 to 8,000 cards per hour, and on this particular quake a total of 87,615 cards were made.

From these cards some 800,000 numerical values were automatically read off by the machine. In this operation an electrical control panel like a miniature telephone switchboard, was used, and the final result was to provide the designer with a value representing the maximum stress to which each individual member is subjected in a simple, single-mass vibrating building.

As to the immediate practical value, Mr. Robison points out that not much reliance can be placed on the results derived from a single earthquake, which was not as strong as it might be. However, he believes that the wealth of numerical values should provide considerable information regarding the presense of resonant vibrations and other matters of interest to the practicing structural engineer, as well as to building and safety officials.

FIELD AND OFFICE



NEEDLE BEAMS SUPPORTED on channels permit a wide opening to be cut in a brick wall close to the ceiling.

Needling an Interior Wall In Tight Quarters

When a wide opening is to be cut in an interior brick wall of a building where the usual needles and shoring cannot be used because the top of the opening is too close to the ceiling, the following method may do the trick. It was used successfully in forming a 10-ft. opening in an 8-in. brick wall with a load of 2,300 lb. per ft. and may be adapted with modifications in similar situations.

The elevation in the accompanying diagram shows two end conditions, the one suitable to the job to be used. At the left end, the lintel channels are supported by steel shims on the bottom flange of needle beam N, while at the right end, a common bearing plate is used. The order of work is as follows:

1. Holes are cut through the wall as indicated by dash and dot lines.

2. Needle beams N are placed with webs carefully lined up by means of a guide composed of a plank and spacing blocks. Then, the spaces above and below the flanges are grouted.

3. When the wall sections between the holes, as well as such ends as shown at the right, are cut away, the needle beams transfer the wall load to the sections immediately below.

4. Two channels are placed with backs against the webs of the needles and bolted as indicated. When the left-end scheme is used, the needles should have large bolting holes in the webs due to the difficulty of accurate location. The end at the right has a fill plate webbed to one of the channels.

5. Steel wedges are driven at all points marked W to force the channel beams to take up the wall load.

6. All bolts are tightened and wall spaces above the channels filled, using loose top plates on the channel flanges.

7. The wall below the channels and interior needles may then be removed, the load already having been transferred to the end bearings by means of the wedging.—LEONARD C. JORDAN, *Consulting Engineer, New Rochelle, N. Y.*

Vertical Blade on Elevating Grader Shaves Side Slopes

To eliminate power-shovel loading, a 10-ft. blade mounted vertically on an elevating grader was used by Mack Walker & Son of Santa Anna, Calif., to shave off cuts and barrow-pit excavations on the Harlan County Dam flood-control project in Nebraska.

Attached rigidly to the grader frame, the blade was set outside the line of the wheels so that material planed from the side of the cut fell to the elevating belt. The blade was designed for quick attachment or removal.

The full face of the pit was cut with a single pass of the elevating grader and the material was thoroughly mixed as it fell to the belt and passed to the trucks.—L. M. Bush, *Oklahoma City, Okla.*

Breaking in drill bits

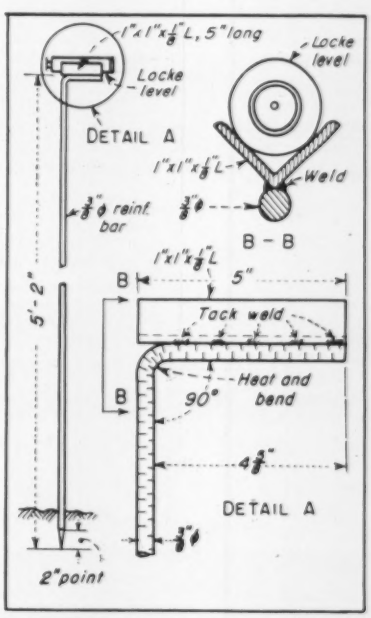
If diamond drill bits used in metal mines and quarries are "broken in" gradually before being placed in continuous use, drilling costs can be reduced by increasing the footage drilled by each bit and by speeding up the penetration rate with less diamond wear, according to a recent report of tests on cast-set coring bits issued by the Bureau of Mines.

One in a series of publications on diamond drilling and diamond bit investigations, the current report describes results of performance tests of various commercial bits in granite, along with a discussion of break-in procedures and the effect of the bit load on the type and degree of wear on different size and grades of diamonds.

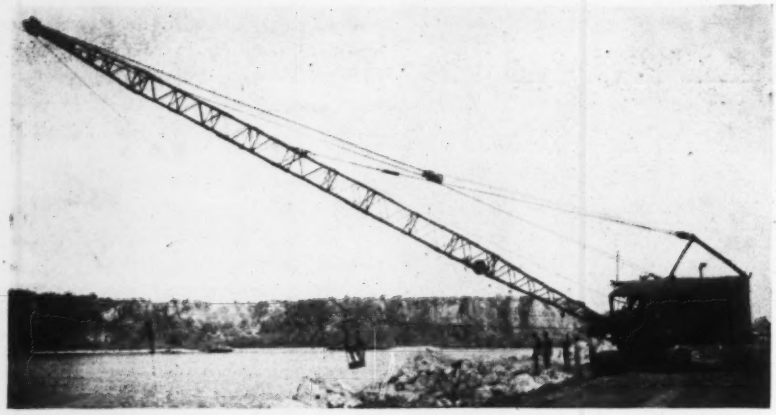
Several design factors affecting the performance of cast-set bits were investigated in the tests, including the type, grade, size, weight, and number of diamonds, the distribution of diamonds on the cutting surface and the contour of the surface, projection of stones through the surface, and the number and size of waterways in the bit.

In general, the results showed that bits set with the smallest diamonds gave the best average drilling results at the lowest cost per foot.

A copy of the publication, Report of Investigations 4233, "Diamond Drilling and Diamond Bit Investigation, Part 2—Tests on Cast-Set Coring Bits," may be obtained without cost by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.



A STURDY STAFF to carry a Locke level constructed of ⅜-in. reinforcing steel can be used effectively on large earthwork projects. — R. H. Sauer, *Warrendale, Pa.*

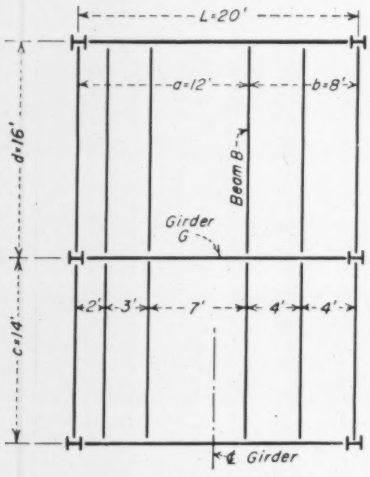


SURVEY CAGE—In constructing a breakwater for the Apra Harbor at Guam Island, engineers on the U. S. Navy project encountered a difficult task on the profile surveying operations or the work of determining the side slopes of the breakwater. This problem was overcome as shown by the accompanying photographs, taken at the scene.

A member of the construction crew took soundings from the specially-built cage. A horizontal line to the cage kept it from turning and permitted accurate shifting of the cage's position.

Shortcut Calculation Of Moments in Girders

Usually, when a beam-and-girder type floor system is designed to support a uniform load, the beam reactions are computed first and then the maximum moment in each girder due to these concentrated loads. The work, however, can be simplified by the following procedure, which is applicable



to both uniform and non-uniform beam spacing:

Step 1. Obtain an equivalent girder loading equal to the sum of one-half the total load on each panel adjacent to the girder divided by twice the girder span.

$$W = \frac{wL\,(c+d)}{2} \times \frac{1}{2L} = \frac{w\,(c+d)}{4}.$$

(See diagram for notation.)

Step 2. Find the beam nearest to the center of the girder and denote as beam B.

Step 3. Multiply the girder loading of step 1 by the distance of B from the left support and by the distance from the right support. This is the desired maximum moment. $M = Wab$.

As an example, the maximum moment in girder G in the diagram will be computed, assuming a uniform load of 200 psf.

$$W = \frac{200\,(14+16)}{4} = 1{,}500 \text{ lb.}$$

$$M = 1{,}500 \times 12 \times 8 = 144{,}000 \text{ ft.-lb.}$$

Thomas E. Faley, *Somerset, Pa.*

Suspended-solids Samples Dewatered with Vacuum System

Six or more independent suspended-solids tests for determining efficiency of solids removal in sewage treatment can be made in about 45 min., a task formerly requiring 3-5 hr., depending on the number of samples. This is done with a vacuum system that draws the liquid through Gooch crucibles simultaneously without constant attention.

The apparatus consists of six or more filtering flasks with side tubes connected individually through ¼-in. piping to a vacuum pump and gage. Mounted on a plywood base, vertical metal supports equipped with burette clamps hold inverted 100-ml. volumetric flasks so that the neck of each flask is slightly immersed inside a Gooch crucible. Crucibles are seated in standard rubber crucible holders inserted in the top of the flasks.

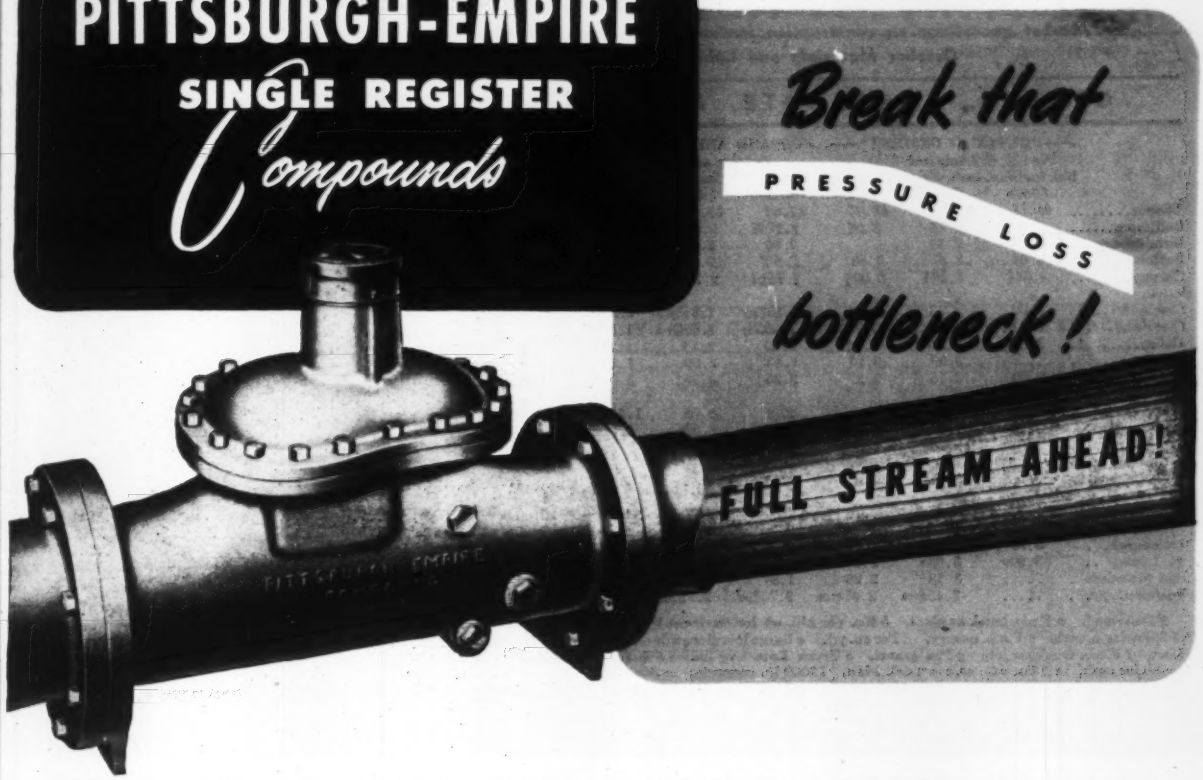
The necks of the 100-ml. volumetric flasks containing the samples are kept just below the surface of the liquid in the Gooch crucibles, and the remaining liquid flows slowly down into the crucibles as vacuum is applied through filter flasks below. After suspended solids have been strained out in the crucibles, standard methods are used to complete the test.

One to six tests may be run at once.

In addition, the asbestos mat (made by mixing 1 gram of asbestos fiber and 1 liter of water) placed on the bottom of Gooch crucibles is tested for proper thickness by placing the crucible over an ordinary 85-cent egg candler containing a 7½-watt bulb. If holes in the crucible base are barely visible, the mat is of proper thickness. The mat is unsatisfactory if no light or too much light comes through.—Norman Wagner, superintendent, Sewage Treatment Plant, *Stamford, Conn.*

With Gooch crucibles and filtering flasks attached to a vacuum-dewatering system, six suspended-solids tests can be made simultaneously without constant supervision.

PITTSBURGH-EMPIRE
SINGLE REGISTER *Compounds*



Pressure loss has always been a problem on compound metered lines. Now this bottleneck can be eliminated. Install Pittsburgh-Empire Compounds. They alone, among meters of this type, have a straightway flow passage for all volumes measured by the propeller unit (see diagrams below).

The horizontally mounted propeller is positioned directly in the flow stream and runs on hard rubber roller bearings. A counter balanced swing action valve effortlessly pivots to full open position; offers negligible resistance to the flow. In all sizes propeller cage and valve orifice diameters are at least equal to actual pipe area. Thus large volume flows are handled with dispatch; without change in direction; quietly and without turbulence.

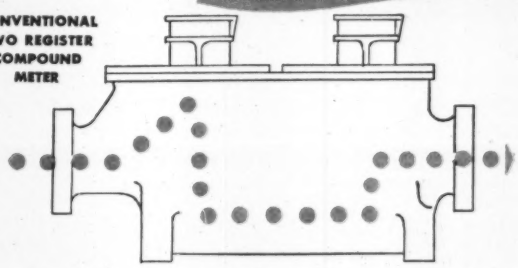
Get all the facts about the lightweight, compact, single register Pittsburgh-Empire. Write for bulletin W-803.

PITTSBURGH EQUITABLE METER DIVISION
Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Atlanta Boston Chicago Houston Kansas City
Los Angeles, New York Pittsburgh San Francisco
Seattle Tulsa

JUST COMPARE FLOW STREAMS

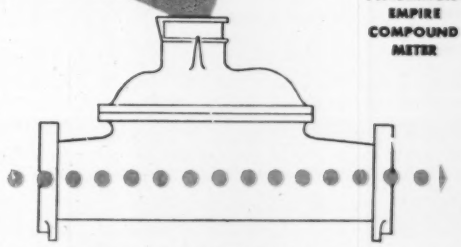
CONVENTIONAL TWO REGISTER COMPOUND METER



"OBSTACLE COURSE" FLOW

Arrow traces the pressure absorbing, wear inducing flow path in a meter having a vertically positioned propeller and lift type valve.

PITTSBURGH-EMPIRE COMPOUND METER



STRAIGHT THROUGH FLOW

Arrow shows the straight line flow stream made possible by the horizontally mounted propeller and swing action valve.

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

October Materials and Labor Prices will appear in the October 14, 1948 issue

CEMENT, AGGREGATE, READY-MIXED CONCRETE — F. O. B. CITY

	PORTLAND CEMENT* Per bbl. C/L lots incl. $1.00 per bbl. for bags, cash. dis. not deducted			SAND AND GRAVEL Per ton, carload lots			CRUSHED STONE Per ton, carload lots		CRUSHED SLAG Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK 8x8x16-in.; truckload del.; per block		READY-MIXED CONCRETE 1:2:4 mix, del.
	Cloth	Paper	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand grav.	Lt.wgt.Agg.	per c.y.
Atlanta	$4.11	$3.34	$3.05	$2.00	$2.00	$1.75	$2.10	$2.10	$1.65	$1.85	$0.1725	$0.1725	$11.00
Baltimore	4.12	3.35	3.06	2.20*ff*	2.20*ff*	1.80*ff*	2.60*ff*	2.70*ff*	2.35*ff*	2.35*ff*	.16	.16*w*	9.85
Birmingham	3.65	2.88	....	2.06	2.06	1.66	2.50	2.50	1.00	1.20	.165	.165	7.75
Boston	4.64	3.87	3.58	2.50*t*	2.50*t*	2.50*t*	1.50*t*	1.60*t*	....	....	.17	.185*w*	10.50*m*
Chicago	4.05§	3.28§	3.00§	2.75‡*d*	2.75‡*d*	3.20‡*d*	2.75‡*d*	2.75‡*d*	2.00‡	2.00‡	.20	.20*x*	....
Cincinnati	4.00	3.23	2.94	1.85‡*pp*	1.85‡*pp*	1.75‡*pp*	2.95‡*bb*	2.95‡*bb*	2.30	2.30	.19	.195	10.40*hh*
Cleveland	3.87	3.10	2.77	1.90*lli*	1.65*ll*	1.55*ll*	3.45‡*h*	3.45‡*h*	2.60	2.60	....	.21	11.20*aa*
Dallas	3.57	2.80	2.52	2.00	2.15	1.75	2.10	2.15	....	....	.0775*p*	.285	8.85
Denver	.....	3.59	3.29	1.85	2.00	1.15	....	....	....	....	.20	.2175*w*	9.65
Detroit	3.92	3.15	2.87	3.25‡	3.25‡	3.00‡	3.00‡	3.00‡	3.00‡	3.00‡	.17	.18*w*	10.60*kk*
Kansas City	....	....	....	2.05	2.05	1.50/1.80*t*	1.45*q*	1.45*q*	....	....	.16*wf*	.175*ny*	9.85*m*
Los Angeles	....	3.72*b*	3.34*b*	1.92*t*	2.02*t*	1.72*tnn*	1.92*t*	1.92*t*	....	....	.085*oo*	....	9.90*m*
Minneapolis	4.05*dd*	3.28*dd*	3.00*dd*	2.30*h*‡*j*	2.30*h*‡*j*	1.35*h*‡*j*	2.50*h*‡*j*	2.50*h*‡*j*	....	....	.21*cco*	....	10.30*jkk*
Montreal	....	2.39*rqq*	2.24*rqq*	....	1.95*bbs*	....	.85*cs*	1.10*cs*	....	....	.177†	.1665*w*†	8.95*s*
New Orleans	....	2.88	2.60	2.32	2.32	1.82	....	....	.90	1.15	.23	....	10.65
New York	....	4.20‡	....	2.00*de*	2.00*de*	1.45*de*	2.00*dv*	2.00*dv*	....	....	.18*ii*	.18*wcii*	10.50*ii*
Philadelphia	4.15‡	3.38‡	3.10‡	2.30‡	2.40‡	2.05‡	1.90‡	1.95‡	1.50	1.50	.22/.25	.22/.25*w*	9.85
Pittsburgh	3.79	3.02	2.74	2.05‡	2.05‡	2.35‡	2.50‡	2.50‡	2.05	2.05	.22*s*	.22*s*	11.00
St. Louis	3.80*o*	3.03*o*	2.75*o*	2.40/2.60‡*oh*	2.40‡*oh*	2.00/2.40‡*oh*	1.50*c*	1.50*c*	1.10	1.15	.215	.23*yo*	10.40
San Francisco	.....	3.38	2.98	1.84	1.84	1.94	1.94	....	....	....	....	.25*y*	10.75*u*
Seattle	.....	3.45*mm*	2.95*mm*	2.75‡*od*	2.75‡*od*	2.75‡*od*	3.50‡*od*	3.50‡*od*	....	....	.22*o*	....	9.75*o*

‡ Delivered. *a* F.o.b. truck at plant. *b* 10c. per bbl. off for payment by 10th of following month. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks, Man. *f* F.o.b. truck on job. *g* Pea gravel. *h* Truck Lots. *i* ½ in. *j* 5% discount for cash. *k* 5 cu. yds. or over, del. Man. *l* 2000 lb. concrete. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 5½ x 8 x 12 in. *q* F.o.b. truck at plant. *r* 10¢ per bbl. off cash 20 days. *s* Sales tax included. *t* Truck delivery. *u* 10 to 100 c.y. brackets. *v* F.o.b. scow, Hudson River, N. Y. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Aver. haul, 7–9 mi. zone. *bb* Under 5 tons. *cc* 8 x 8 x 18 in., also. *dd* Dealers sell only in LCL. This is price for CL and does not include dealer's commission. *ee* 20c refund for each returnable bag. *ff* LCL. *gg* 10c. refund for each returnable bag. *hh* Truck loads up to 500 c.y. Over 500 c.y lots, 50¢ less per yd. *ii* Yard price. *kk* 2500 lb. compression strength. *jj* 30¢ refund for each returnable bag. *ll* Price at plant, called for. *mm* 10¢ per bbl. off cash 10 days. *nn* Concrete sand. *oo* 4x8x12 std. wgt. *pp* 5 tons or more. *qq* Dealer's commission not included. * Prices include dealer's commission except where indicated to the contrary. § Maximum prices. Sales at lower levels. † Aug. prices were for 8x12x16.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES AT CEMENT MILLS

Charge for bags not included. For cloth bags, add $1.05 per bbl.; 25¢ refund allowed for each returnable bag; for paper bags add 28¢ per bbl., not refundable.

	Bagged		Bagged		Bagged		Bagged
Richard City, Tenn.	$2.25	Independence, Kan.	$2.30	Duluth, Minn.	$2.30/2.40	Harrys, Tex.	$2.15	Wyandotte, Mich.	$2.25
Clinchfield, Ga.	2.25	Hannibal, Mo.	2.20	Hudson, N. Y.	2.25/2.30	Manchester Switch, Tex.	2.25	Buffalo, N. Y.	2.35
Kingsport, Tenn.	2.25	Northampton, Pa.	2.30	North Birmingham, Ala.	2.10	South Norfolk, Va.	2.45	Oswego, N. Y.	2.40
West Des Moines, Iowa	2.30	Universal, Pa.	2.20	Spocari, Ala.	2.20	Alpena, Mich.	2.20	Cleveland, O.	2.35
Nazareth, Pa.	2.25/2.30	Waco, Tex (+ 9¢ tax)	2.20	Limedale, Ind.	2.20	Detroit, Mich.	2.35	Toledo, O.	2.35
Bath, Pa.	2.30	Steelton, Minn.	2.30	Bonner Springs, Kan.	2.30	Muskegon, Mich.	2.35	Milwaukee, Wis.	2.35
Buffington, Ind.	2.20	Leeds, Ala.	2.10	New Orleans, La.	2.35	Saginaw, Mich.	2.30	Ironton, O.	2.35

Montreal City (Discount 10¢ per bbl. 20 days), $2.08.

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS — F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES Per gal., 80–300 penetration		CUTBACK ASPHALT Per ton		ROAD OIL Per gal.	ASPHALT EMULSION (Quick-breaking) Per gal.	
	Granite per M lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore	150.00‡	52.70‡	.....	$23.00	.....	$ .095	$0.15	$ .095*h*	$ .17*h*	$ .095*v*	$ .095	$0.115
Birmingham	.....	32.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	.....	.....	.....	23.00*o*	$34.00*o*	.0936*o*	.175*o*	.095*ho*	.185*ho*	.095*o*	.103*o*	.195*o*
Chicago	150.00‡*y*	85.00/88.00*e*‡	3.10/4.15*d*‡	22.50*b*	32.00*b*	21.50*bg*	31.00*bg*	.097/.10*bh*	.....	.082/.0845*b*	.0925/.1025*b*	.14/.165*b*
Cincinnati	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland	186.52	49.00‡	3.87*u*	30.00	40.00	29.50*g*	39.50*g*	.135*h*	.22*h*	.13	.20	.27
Dallas	*l*	40.00	*l*	23.38	42.17	.0987	.1837	26.15	46.65	.0962	.1037	.....
Denver	.....	41.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	....	63.00*x*	.....	27.00	26.00	18.40*g*	24.40*g*	.0811*h*	.128*h*	.075	.1085	.1522
Kansas City	.....	40.00*q*	.....	20.45*r*	.....	.....	.....	.081*hr*	.....	.071*r*	.....	.....
Los Angeles	*l*	.....	*l*	17.50*mf*	32.00*mfw*	17.50*gm*	32.00*mw*	18.50*m*	25.50*mw*	17.00*gm*	.075*cc*	.145*cc*
Minneapolis	.....	.....	2.79*d*	28.00	37.00	23.00*g*	34.00*g*	27.00	38.00	.105	.13	.23
Montreal	140.00	.....	.....	25.00*k*	34.65*k*	15.70*kp*	19.95*kp*	15.30*kp*	17.30*kp*	14.20*kj*	.174*k*	.215*k*
New Orleans	.....	.....	.....	20.00*a*	.....*s*	20.00*qa*	.....*s*	.095*hadd*	.....*s*	.095	.0975	.16*n*
New York	.....	.....	2.50*d*	26.50	38.86	25.50*g*	44.88*g*	.1090*h*	.1917*h*	.1040	.1090	.1897
Philadelphia	150.00	62.00	4.06	23.00	.....	22.00*g*	.....	.095*h*	.....	.....	.....	.....
Pittsburgh	165.00	42.00	4.50	26.00	39.00	.12	.24	27.00	40.00	.095	.10	.21
St. Louis	.....	.....	.....	21.40	.....	.....	.....	.....	.....	.....	.1025	.....
San Francisco	.....	57.75*c*	.....	17.50*ee*	32.00*cee*	17.50*qeeff*	.....	19.50*ee*	.....	.....	.0725	.1425
Seattle	.....	.....	.....	16.50*i*	33.00*i*	15.00*ig*	.....	18.00*i*	22.00*aai*	16.00*ig*	.0675*i*	.0825

‡ Delivered. *a* F.o.b. Baton Rouge. *b* F.o.b. refinery. *c* 2½ x 8½ x 4 in. *d* 2-in. interior block, 6-lb. treatment. *e* 3½ x 4 x 8½. *f* 40–80 penetration. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* Shipped in drums, per drum. *k* Tax included. *l* Not used. *m* F.o.b. refinery, El Segundo. *n* 55 gal. drums. *o* Price at plant, in Everett. *p* Per 100 gal. *q* F.o.b. Buffalo. F.o.b. Sugar Creek, Mo. *s* Drums not available. *t* Truck deliveries in Greater Cleveland. *u* 3-in. *v* Bulk, refinery. *w* Shipped in steel barrels, no longer in double head wood barrels. *x* Truck deliveries in Detroit $75.00. *y* Carload lots. *aa* In customer's drums. *cc* F.o.b. refinery, Inglewood. *dd* Medium curing. Rapid curing, $.0975; slow curing, $.0925. *ee* F.o.b. Richmond. *ff* 50–300 penetration. *gg* May-June price of $52 was for 4 x 3½ x 8½.

IRON AND STEEL PRODUCTS—PER 100 LBS. BASE MILL PRICES

	STRUCT. SHAPES–PLATE	REINF. BARS billet *ab*	RIVETS ½-in. structural	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	Light *c*	Re-rolled	TRACK SUPPLIES Angle Bars	Std Spikes	Tie Plates	Track Bolts *d*
Birmingham Area	$3.25	$3.35	$6.75	....	$64.00	$71.00	Not	$4.25	$5.35	$4.05	....
Chicago Area	3.25	3.35	6.75	$4.05	64.00	71.00	avail-	4.25	5.35	4.05	....
Pittsburgh Area	3.25	3.35	6.75	4.05	64.00	71.00	able	4.25	5.25	4.05	....
Buffalo Area	3.30	3.35	6.75	4.05	64.00	71.00	....	4.25	5.35	4.05	$8.50
Cleveland	....	....	6.75	....	.....	.....	....	....	....	....	8.50
Youngstown Area	....	3.35	....	....	.....	.....	....	....	5.35	....	....
Geneva	3.25	....	....	....	.....	.....	....	....	....	....	....
Los Angeles	3.25	4.10	....	....	.....	.....	....	....	5.35	....	....
Pueblo	3.25	3.35	....	....	64.00	71.00	....	4.25	5.35	4.05	8.50

a To fabricators. To consumers: $4.10; except $4.85 Seattle, Wash. *b* Rail steel price $4.65; except $5.25 Huntington, W. Va. *c* Rail steel $94 per ton Williamsport, Pa. *d* Treated. Untreated $8.25; except $7.50 Fairfield, Ala.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS *g* Per 100 lb., base price *u* 5 tons to carload lot *b* New billet	Rail steel	Add Switch	$ cwt. for Del.	EXPANDED METAL LATH *k* Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING $ Per 100 sq. ft., carload lots 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in., No. 6 & 6 wires	SHEET PILING Per 100 lb. base price
Atlanta	$4.75	$5.225*k*	$5.225*k*	$.025	$.10	$31.50	$33.50				....
Baltimore	5.48	4.47*l*	....	....	.10	35.50	40.50				....
Birmingham	5.15	5.15	5.50	.05	.15	43.00*p*	45.50*p*				....
Boston	5.54*k*	5.46*k*	4.84*kk*	....	.10/.15	31.00	33.00	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $2.36 Monessen, Penn., $2.36	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $1.63 Monessen, Penn., $1.64	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $2.47 Monessen, Penn., $2.48	$4.05*ee*
Chicago	4.35	4.20/4.70*ff*	4.20/4.70*ff*	.05	.05	31.00‡	33.00‡				4.05*ee*
Cincinnati	5.60‡	5.55*r*	....	....	....	33.00*zee*	35.00*zee*				4.05*ee*
Cleveland	5.60	4.37*r*	....	....	.10	34.50	36.50				....
Dallas	6.30	6.25	6.25	....	....	33.75	35.75				....
Denver	6.45	6.30*r*	....	....	....	43.00*s*	50.00*qq*				6.30*s*
Detroit	5.45	....	....	....	.10	33.50*x*	35.50*q*				4.40*ee*
Kansas City	....	....	....	....	....	.....	.....				....
Los Angeles	5.10*f*	5.10	....	....	....	44.00*f*	49.00*kk*				....
Minneapolis	5.61‡	5.81*cc n*	5.81*cc n*	....	.15	34.50	36.50				4.05*ee*
Montreal	5.10*i*	4.70*i*	4.70*i*	....	....	44.10*h*	46.80*h*				250.00*jqq*
New Orleans	....	5.00*ok*	....	.05	.10	32.00	32.00				....
New York	5.68*r*	5.75	....	....	.15/.20	34.50*st*	36.50*st*				4.05*ee*
Philadelphia	5.04	5.15	....	....	....	30.00‡	32.00‡				....
Pittsburgh	4.40/4.50	4.40/4.50	4.40/4.50	.05	.10	32.50	34.50				....
St. Louis	5.39*k*	5.24*c*	5.24*c*	....	....	.....	.....				....
San Francisco	5.90*ii*	5.65	....	....	....	36.50	38.50				5.25
Seattle	4.30*e*	5.25*el*	....	....	....	40.00*w*	.....				5.30*dd*

‡ Delivered. *a* Mill prices. *b* 1–5 tons, add 35c. Less than 1 ton, add 50c. *c* 20 tons or over. *d* Mill price plus freight. *e* F.o.b. plant *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel. *h* List price. Dominion tax exempt. Provincial and Municipal tax extra. *i* Plus Dominion, Provincial and Municipal sales tax. *j* Price per ton. *k* F.o.b. city. *l* Intermediate and hard grade, new billet. *m* Per sq. yd. *n* 5 to 8 tons base. *o* 5 to 15 tons base. *p* Del. of 5000 sq. yd. or less. *q* Std. ribbed. 4 lb. per sq. yd. *r* 5 tons or over. *s* LCL. *t* Asphalt coated. *u* Note: Revised size extra—1 in., 1¼ in., 1½ in. 10¢, ¾ in., ⅝ in. 15¢, ½ in. 20¢, ⅜ in. 35¢, ¼ in. 55¢, ¼ in. $1.30. *v* Under 20 tons. Straight. *w* Copper bearing. *x* 2.5 lb. per sq. yd. *y* $.0093 transportation tax included. *z* Copper alloy. *ee* F.o.b. cars Chic. plus freight. *dd* F.o.b. dock. *ee* F.o.b. cars. *ff* Carload lots. *gg* Including sales tax. *ii* Rolled at Geneva mill. *kk* ¾" ribbed.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, Delivered ASTM C13–44T std. 8 in. s.s.	std. 12 in. s.s.	24 in.	36 in.	CLAY DRAIN TILE ASTM C4–24 Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM C 14–41 12 in.	24 in.	WROUGHT STEEL PIPE (Full standard weight) 2½ & 3 in., Black	Butt Weld Galv	3½ to 6 in., Black	Lap Weld Galv
Atlanta	$100.10	$0.43	$0.67	$3.39	$7.00	$114.00	$140.00	$0.45	$2.00				
Baltimore	104.50	.378	.729	3.105	8.098	147.00	228.00	.80	2.20				
Birmingham	93.50	.40	.72	2.84	....	210.00‡	375.00‡	.90	2.50				
Boston	107.90	.441*usx*	.8505*usx*	3.87*usy*	10.36*usy*	173.40	267.60	1.45‡*mq*	3.60‡*mq*	48%	32½%	42½%	26%
Chicago	106.70	.59	1.14	4.81	13.45	150.00‡	270.00‡	.65	2.25	50½%	31½%	42½%	23%
Cincinnati	105.20	.441	.8505	3.51	9.53	154.80‡	241.20‡	.60	2.25	49½%	30½%		
Cleveland	107.30	.35*z*	.675*z*	2.97*z*	9.3025*z*	147.50	231.00	.65	2.50				
Dallas	109.08	.365	.684	2.72	6.25	109.00	131.00	.48	1.55				
Denver	113.92	.41*dd*	.71*dd*	2.98*dd*	....	.....	.....	.74*dd*	2.50*dd*				
Detroit	107.30	.553	1.07	4.185	12.63	195.00‡*m*	303.00‡*m*	.65	2.50				
Kansas City	108.42	.39*m*	.705*m*	2.78*m*	7.15*m*	175.00*m*	310.00*m*	.60*l*	1.90*l*				
Los Angeles	120.30	.426	.927	4.532	11.298	193.00‡	324.60‡	.65	...				
Minneapolis	110.30	.62*mo*	1.12*mo*	4.35*mo*	11.290	.....	.....	1.23*h*	3.50*h*				
Montreal	90.00	.73*s*	1.28*s*	4.20*s*	6.80*es*	.....	.....	72.00*jkaa*	218.00*jkhaa*				
New Orleans	103.10	.412	.762	3.955	9.15	231.00*bb*	.....	.55	1.95				
New York	103.50/108.50	.62	1.14	4.45	12.30	.....	.....	1.00	2.25				
Philadelphia	101.30	.54	.99	4.08	10.25	235.00‡	300.00‡	1.25*h*	3.20*h*				
Pittsburgh	107.82	.364*m*	.702*m*	2.70*m*	6.625*m*	130.20	197.40	1.05*h*	2.50*g*				
St. Louis	104.60	.46	.83	3.31	7.85	.....	.....	1.10*il*	2.30*hl*				
San Francisco	120.30	.450*d*	.99*d*	3.96*d*	9.90*d*	188.00*dl*	313.00*dl*	.69	2.85				
Seattle	122.10	.51*b*	.91*b*	....	....	150.00*e*	.....	.80	2.40				

Sparrows Pt., Md., Youngstown, Pa., Indiana Harbor, Ind. — F.o.b. Mill: Sparrows Pt., Md., Youngstown, Pa., Indiana Harbor, Ind. — F.o.b. Mill: Sparrows Pt., Md., Indiana Harbor, Ind. — F.o.b. Mill: Sparrows Pt., Md., Indiana Harbor, Ind.

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, CL, Burlington, N. J. (base) $98.50. Based on existing freight rates; subject to rate change. Gas pipe and class A, $5 per ton additional. 4 in., $5 per ton additional, 30 in. and larger, usually $1 per ton less. *b* Extra strength ASTM C 200–44T. *c* 4-in., $90. *d* SS361-A. *e* 30 in. *g* Culvert pipe. Reinforced, ASTM C76–41. *h* Reinforced. ASTM C75–41. *i* Reinforced. ASTM C76–37. *j* Centrispun. *k* Per 100 ft. *l* F.o.b. plant. *m* Truck delivery. *o* Listed price is based on LCL (no minimum). *p* Less than 5 ton loads, price per ft. *t* Within switching limits. *u* ASTM C13–40. *u* F.o.b. city. *x* 2 ft. lengths. *y* 3 ft. lengths. *z* CESA A60–1941 specifications used. *aa* No. standard specifications in Can. *bb* Freight allowed to destination in city. *ee* Truck loads; f.o.b. plant, Newton. *dd* LCL, delivered, f.o.b. truck.

WROUGHT STEEL PIPE: Discounts from standard list consumers carload prices. Base price approx. $200 per net ton. List prices per ft.: ¼ in., 5½¢; ⅜ in., 6¢; ½ in., 6¢; ¾ in., 8½¢; 1 in., 11½¢; 1 in., 17¢; 1¼ in., 23¢; 1½ in., 27½¢; 2 in., 37¢; 2½ in., 58½¢; 3 in., 76½¢; 4 in., $1.09; 6 in., $1.92; Discounts from base. Freight rates to destination to be added to price, plus 3 percent tax on transportation.

WROUGHT IRON PIPE: List prices per ft. same as wrought steel pipe. Discount for Pittsburgh base. Butt weld — 1 in. and 1¼ in. black, +4.5, galv. +26; 1¼ in. black, 1.5, galv. +22.5; 2 in. black 2, galv. +22. Lap weld — 2½ in. to 3½ in. black +5, galv. +25.5; 4½ in. to 8 in. black +2, galv. +21. Freight rates to destination to be added to name delivered price.

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F. O. B.

		SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)								LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment* (See note for base price)	
		All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)											
		1x6 s4s	1x8 s4s	2x4 s4s	2x6 s4s	2x8 s4s	2x10 s4s	3x12 R/L	6x12 R/L	12x12 R/L	2x12 R/L	12x12 R/L	5/8"
Atlanta	l	**$70.00**	**$17.00**	**$60.00**	**$62.00**	**$65.00**	**$68.00**	**$70.00**	.....	.....	.....	.....	**$22.32**
Baltimore		**90.00**	**95.00**	**92.00**	**95.00**	**95.00**	**98.00**	**115.00**	.....	.....	175.00	175.00	22.86
		120.00	*120.00*	*115.00*	*115.00*	*115.00*	*115.00*	*125.00*	*125.00*	*125.00*	.....	.....	.....
Birmingham	l	**87.50**	**90.50**	**75.00**	**78.00**	**80.00**	**82.50**	**105.00**	.....	.....	130.00	125.00	21.78
	l	*80.00*	*80.00*	*75.00*	*75.00*	*75.00*	*75.00*	*85.00*	*85.00*	*85.00*	.....	.....	.....
Boston		80.00[3]	80.85[3]	85.00[3]	85.00[3]	85.00[3]	90.00[3]	100.00[3]	.....	.....	.....	.....	22.86
		100.00	*100.00*	*102.00*	*85.00*	*85.00*	*105.00*	*105.00*	*105.00*	*105.00*	105.00	105.00	.....
Chicago	‡	**90.00**	**95.00**	**80.00**	**85.00**	**87.00**	**93.00**	**100.00**	.....	.....	120.00	120.00	18.72
	‡	*108.00*	*108.00*	*100.00*	*100.00*	*100.00*	*105.00*	*105.00*	*105.00*	*105.00*	.....	.....	.....
Cincinnati		**102.00**	**105.00**	**105.00**	**100.00**	**108.00**	**115.00**	.....	.....	.....	145.00	145.00	21.78
Cleveland		**84.00**	**87.89**	**85.00**	**85.00**	**85.89**	**90.94**	.....	.....	.....	.....	.....	22.20
Dallas	l	**71.00**	**71.00**	**61.00**	**59.00**	**61.00**	**66.00**	**80.00**	.....	.....	72.00	80.00	18.72
Denver		*101.00*	*101.00*	*113.00*	*110.00*	*110.00*	*111.00*	*111.00*	*130.00*	*129.00*	.....	.....	13.92
Detroit		**85.00**	**87.00**	**85.00**	**85.00**	**88.00**	**96.50**	.....	.....	.....	.....	.....	21.78
		95.75	*95.75*	*93.75*	*91.25*	*91.25*	*91.75*	.....	.....	.....	.....	.....	.....
Kansas City	b	**110.00**	**110.00**	**100.103**	**100.103**	**105.00**	**105.00**	.....	.....	.....	105.00	105.00	16.56
	b	*115.00*	*115.00*	*105/108*	*105/108*	*110.00*	*110.00*	*120/125*	*135.00*	*135.00*	.....	.....	.....
Los Angeles	a	*104.00*	*104.00*	*103.00*	*103.00*	*103.00*	*103.00*	*111.00*	*120.00*	*110.00*	.....	.....	13.38g/h
Minneapolis	‡b	117.00[3]	117.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	16.56
	‡b	*113.00*	*113.00*	*113.00*	*113.00*	*113.00*	*115.00*	*130.00*	*130.00*	*130.00*	.....	.....	.....
Montreal	e	75.00	76.00	75.00	75.00	76.00	85.00	.....	.....	.....	.....	.....	.....
		155.00	*155.00*	*155.00*	*155.00*	*155.00*	*155.00*	.....	*130.00*	.....	.....	.....	.....
New Orleans	l	**80.00**	**90.00**	**75.00**	**80.00**	**80.00**	**77.00**	**85.00**	.....	.....	100.00	105.00	18.72
	l	*68.00*	*68.00*	*70.00*	*67.00*	*67.00*	*67.00*	*71.00*	*67.00*	*72.00*	.....	.....	.....
New York	‡	**95/100**	**95/100**	**Range from $90.00 to $95.00**				**110/115**	.....	.....	175/200†	175/200†	22.86
	‡	.....	.....	*Range from $107.50 to $112.50*				*110/115*	*120/125*	*120/125*	.....	.....	.....
Philadelphia				**Range from $100.00 to $110.00**				**100/110**	.....	.....	180.00	180.00	22.86
				Range from $110.00 to $120.00				*110/120*	*127.00*	*127.00*	.....	.....	.....
Pittsburgh	l	**78.00**	**79.00**	**82.00**	**84.10**	**89.25**	**97.70**	**112.00**	.....	.....	130.20	141.00	22.56
	l	*103.60*	*103.60*	*105.60*	*105.60*	*109.00*	*129.75*	*122.00*	*150.00*	*166.00*	.....	.....	.....
St. Louis	‡j	**95.00**	**98.50**	**87.50***m*	**92.50***m*	**99.50***m*	**107.00***m*	.....	.....	.....	.....	.....	18.72
	‡j	.....	.....	*115.00n*	*115.00n*	*115.00n*	*115.00n*	.....	.....	.....	.....	.....	.....
San Francisco	d	*79.00*	*79.00*	*79.00*	*77.00*	*77.00*	*75.00*	*75.00*	*75.00*	*75.00*	.....	.....	10.08g
Seattle	l	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*75.00i*	*75.00i*	*75.00i*	.....	.....	12.30g

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [3] Spruce. [4] Western Pine No. 3 Common. ‡ Delivered. *a* Yard prices. *b* Retail prices, less than CL. *c* 5 M ft. or less. *d* Direct mill prices; f.o.b. purchasers carrier or truck. *e* Tax exempt. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* No. 1 common. *j* Delivered in 5000 ft. lots. *k* These are retail yard prices quoted per truck load in Greater Cleveland. Less 2% for cash. Truck lots, 1 F.o.b. mill. *m* 8 to 12 ft. lengths. *n* 8 to 16 ft. lengths.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ½", $188.00; on ¼", $218.00. For other centers add rail freight increment from table on proper size. Oiling and edge sealing charges included.

* Freight rates include 20% emergency increase granted railroads on Jan. 5.

† 18 ft. and under.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Jan. 16, 1946*a* Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb. lots*	
	A quality	B quality		
Atlanta	76%	76%	$0.2025	
Baltimore	70–10%	71–10%	.2025	
Birmingham	68%	68%	.1575	
Boston	.....	60%*i*	.2025	
Chicago	64%	64%	.2025	
Cincinnati	67–6%*e*	67–6%*e*	.2025	
Cleveland	67–10–10%	67–10–10–10%	.2425	
Dallas	65%	65%	.215	
Denver	66%	66%	.2075	
Detroit	62-10-10%	62-10-10%	.2025	
Kansas City	68-10%*e*	68-10%*e*	.2075	
Los Angeles	58%	63%*f*	.21	
Minneapolis	64%	64%	.2075	
Montreal	40–5%*bc*	40–10–5%*bc*	18.90*h*	
New Orleans	68%	68%	.2125	
New York	71%	72%	.32*g*	
Philadelphia	69%	70%	.2025	
Pittsburgh	70%	70%	.175	
St. Louis	70–10%	70–10%	.2075	
San Francisco	66%	73%	.2075	
Seattle	57%	58%	.21	

Price of 60% Ammonia Gelatin is $0.0125 per lb. higher than 40%

Glass: *a* Jobbers' list price per box, 14 x 20, ss, $20.75 for A quality, $18.00 for B quality; 14 x 20, ds, $30.75 for A quality, $26.00 for B quality. *b* Discount from list, Sept. 1939; sales tax included, but 6% tax exemption not allowable for. *c* Single thickness. *e* Discount from list of Aug. 15, 1938. *f* ss; ds—62%. *i* Double thickness 65%.

Explosives: * Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas. *g* In borough of Kings, Queens, and Richmond and in Manhattan south of Canal St., add delivery charge of $9.00 per trip. *h* F.o.b. city per 100 lb, forcite, 40%, 60%, $20.65.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.155	$0.1825	$0.2025
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.16 –.1675	.1875–.20	.2075–.22
Rocky Mtn. States	.16 –.1725	.1875–.20	.2075–.225
Pacific N. W. States	.1575–.17	.19 –.2025	.21 –.2225
Pacific S. W. States	.155 –.1625	.1875–.195	.2075–.2175

PILES, TIES F. O. B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail — Pine*	By Rail — Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	....
12-in.— 2-ft. from butt	6-in	50 to 59-ft.	.37	....
12-in.— 2-ft. from butt	6-in.	60 to 69-ft.	.39	....
12-in.— 2-ft. from butt	6-in.	90 to 100-ft.	....	.72
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	....	.73
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.43	.80
14-in.— 2-ft. from butt	6-in.	70 to 79-ft.	.47	.74
14-in.— 2-ft. from butt	5-in.	80 to 85-ft.	.60	.75
14-in.— 2-ft. from butt	5-in.	85 to 89-ft.	....	.76
14-in.— 2-ft. from butt	5-in.	90 to 100-ft.	....	.80

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak[i]	....	.....	.....	.....
	Pine[i]	....	.....	.....	.....
New York	S. L. Sap Pine	$1.65	$2.85	$2.00	$3.30
	Mixed Oak	1.80	3.05	2.50	3.60
Birmingham	Hardwood	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.55/2.60*a*	....	3.25/3.40*a*
Los Angeles	Douglas Fir	1.86	3.25*a*	....	.....
Philadelphia	Red Oak	2.33	3 *a/s*	3.10	4.25*a*
St. Louis	White Oak	1.90	..	2.60	.....
	Red Oak	1.80	2.45*a*	2.50	3.50*a*
	Sap Pine or Cypress	2.30*a*	....	....	.....
San Francisco	Douglas Fir	1.60*e*	2.80*f*	2.10*bf*	3.88*ef*
Montreal	Birch or Maple	....*h*	....*h*	....*h*	....*h*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 7" x 9" x 8'. *c* Empty cell. *e* Green. *f* F.o.b. cars. *h* No constant price available. *i* Not available

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums f.o.b. works, per 100 lb.	$4.25
Chlorine cylinders, liquid, per lb. f.o.b. works	.07–.12
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, f.o.b. works, ton	22.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	1.80
Soda ash, 58%, in paper bags, per 100 lb. dense	1.50
Sulphate of aluminum, commercial, in 100-lb. bags f.o.b. works	1.50
Sulphate of copper, in bags, per 100 lb f.o.b. works	8.10

Ample Blade Clearance

IN ALL OPERATING POSITIONS

● Experienced motor grader operators know that blade clearance—*plenty of it, in the right places*—is essential to fast, efficient blade positioning.

That's why Adams Motor Graders are designed and built with an abundance of blade clearance at all critical points:

1. **Between Blade Ends and Tires:** Lots of room provided for sharp blade angles—without tire interference, front or rear.
2. **Between Blade and Frame:** Space aplenty for free movement of the blade heel.
3. **Between Blade Assembly and Frame Arch:** More space for higher blade lift and better ground clearances.
4. **Between Blade and Scarifier Block:** Ample room for easy reversing of blade under scarifier block.

This is another example of how thoughtful engineering makes Adams Motor Graders *Your Best Buy—All Ways.* See your local Adams dealer for complete information and illustrated literature.

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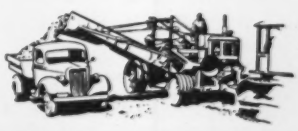


MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME — DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity Common backing	Straight hard	LIME Per ton, In paper, Carload lot Hydrated finishing	Common hydrated	Pulverized, or lump
Atlanta	.....	.....	.....	.....	.....	.....	$25.00	$25.00	$19.00	$17.50	$17.50
Baltimore	$120.00	$126.00	$220.00	$240.00	$315.00	$340.00	31.00*k*	33.00*k*	30.18	18.00	.....
Birmingham	97.50	104.00	195.00	231.00	.....	.....	20.00*ff*	22.50*gg*	24.67	18.10	.....
Boston	145.65†	155.35†	291.30†	330.15†	.....	.....	32.00*i*	35.00*i*	30.80†	26.40†	.....
Chicago	115.00	122.50	230.00	.....	.....	.....	21.00	23.00	25.50	19.50	.....
Cincinnati	155.00*j*	165.00*j*	220.00*jdd*	.....	.....	.....	33.00*j*	33.00*j*	19.50*j*	21.20*j*	.....
Cleveland	118.00*cc*	126.00*cc*	236.50*cc*	.....	.....	.....	27.50	27.50	24.00	22.00	27.50*ee*
Dallas	.....	110.00	.....	.....	.....	.....	18.75	33.25	28.00	22.00	.....
Denver	.....	.....	.....	.....	.....	.....	30.00	30.00	34.80*bb*	28.00*bb*	34.00*bb*
Detroit	117.08	124.88	234.15	234.15	290.68	332.20	30.00*cc*	31.50*cc*	30.00	28.00	28.00
Kansas City	112.00	120.00	.....	.....	.....	.....	16.00*o*	18.50*o*	36.00*p*	30.00*p*	30.00*p*
Los Angeles	*r*	*r*	*r*	*r*	*r*	*r*	20.00§	.....	.....	36.00	35.00
Minneapolis	151.00*p*	174.00*p*	315.00*p*	174.00*wp*	.....	.....	30.00*ep*	.....	34.50*bbe*	25.50*bbe*	34.50*bbde*
Montreal	110.00*aq*	120.00*aq*	225.00*aq*	.....	.....	.....	25.50	37.00	12.50*ub*	14.00*ub*	.....
New Orleans	160.00	160.00	300.00	.....	.....	.....	29.00	.....	38.00	26.00	37.50
New York	112.20*h*	119.60*h*	164.50*h*	179.40*hn*	.....	.....	30.50	.....	34.40	26.80	.....
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	27.00	30.00	29.75	17.50	24.50
Pittsburgh	98.50	105.80	181.85	217.30	265.85	303.60	26.00	38.00*y*	20.45	18.65	2.97*m*
St. Louis	119.00	130.00	235.00	235.00	320.00	.....	30.50*el*	28.50*el*	.80*aaap*	.60*aaap*	1.00*aaspec*
San Francisco	132.00*a*	148.50*a*	198.00*dda*	148.50*ta*	.....	.....	30.00	.....	24.95	24.95	2.49*m*
Seattle	150.00*cc*	160.00*cc*	.....	160.00*ccw*	.....	.....	32.00	39.00	32.00*shh*	32.00*shh*	3.60*mhh*

† F.o.b. *a* Smooth. *b* Per 50 lb. bags. *c* 6 x 12 x 12 in.-3 cell. *d* Pulverized hot. *e* 5% discount for cash. *g* 5½ x 8 x 12. *h* F.o.b. trucks, job site N.Y.C. *i* F.o.b. warehouse only. *j* Truck load or over. *k* $1.00 discount. *l* Red face. *m* Per bbl., 180 lb. *n* 7⅝ x 7⅝ x 12. Speed tile. *o* F.o.b. Buffalo. *p* Truck lots. *q* Provincial and Municipal tax extra. *r* Not used because of earthquake danger. *s* 2% discount for cash. *t* 5½ x 8 x 11½. *u* Tax exempt. *v* Sand lime. *w* 5 x 8 x 12. *y* Stacked. *z* Pebble lime price per 80 lb. sack. *aa* Price per sack. Lime not sold per ton. *bb* LCL. *cc* Truck delivery. *dd* 6 x 12 x 12. *ee* Pebble lime. *ff* 80% common. *gg* Select. *hh* LCL. § F.o.b. plant.

PAINT, ROOFING — F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx) bbl. Dry *a*	WHITE LEAD Per 100 lb. in 100 lb. cases In oil *w*	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 360 lb. bbl. per ton
Atlanta	$23.60	$31.375	$1.75	$2.70	$1.65	$2.06‡	$2.06‡	$2.06‡	$1.00‡	$36.00‡
Baltimore	23.35	31.00	2.25	3.50	2.75	2.75	3.30	3.30	.55	34.00
Birmingham	23.60	31.375	4.40	4.52	....	3.05	3.00	3.00	.48	42.00*ee*
Boston	23.35	31.00	....	....	....	....	....	2.75‡*q*	....	34.00
Chicago	23.35	31.00	....	....	....	2.82‡*u*	2.87‡*o*	2.87‡*o*	35.00‡*bbs*	38.00‡
Cincinnati	23.35	31.00	....	....	....	2.44‡	2.54‡	2.54‡	.35*y*‡	40.00‡
Cleveland	23.35	31.00	3.00	3.00*s*	3.00	2.55	2.60*o*	2.50*o*	.36*y*	38.00
Dallas	23.35	31.00	....	4.05	....	3.50*q*	3.75*q*	4.35*q*	.30	45.00
Denver	23.35	31.50	2.88	4.38	2.63	3.17*o*	3.10*o*	.....	.41*ff*	48.00
Detroit	23.35	31.00	4.05	3.40	4.50	2.44	2.54	2.54	....	35.00
Kansas City	23.35	31.125	3.30*g*	3.55*g*	3.16*g*	3.00	3.25	3.50	.54	31.00
Los Angeles	23.60	31.50	2.80	4.00	3.50	2.32	1.77*e*	*l*	.65	*l*
Minneapolis	23.35	30.625*m*	....	....	....	2.42*idd*	2.47*hidd*	2.47*hidd*	.42*idd*	35.00*rdd*
Montreal	.....	23.65	3.25*p*	4.20*p*	3.62*p*	3.45*t*	3.15*tf*	2.65*tf*	....	2.60*tt*
New York	23.35	31.00	3.45*y*	....	3.45*y*	2.28	2.3*oo*	2.38*o*	.34*s*	33.00
Philadelphia	23.35	31.00	3.25	3.65	3.15	2.54	2.94	2.94	.37	26.00
Pittsburgh	23.35	31.00	2.00	2.40	1.90	3.00	3.10*o*	3.10*o*	.37	40.00
St. Louis	23.35	31.00	....	....	....	2.84	2.96	2.96	.60	36.00
San Francisco	23.60	31.25	1.80	2.75*n*	1.35	2.27*x*	3.30*aa*	....	.38*q*	.....
Seattle	23.60	31.50	2.95*m*	2.95*m*	....	3.25*mqcc*	3.35*hmcc*	....	.49*mcc*	46.75*jmcc*

‡ Delivered Note: Red lead in oil 50c higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* 15 lb. *f* Per 432 sq. ft. *g* 50 gal. drums. *h* Per roll. 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per cwt. *l* Not used. *m* 1% discount for cash. *n* May, 1941 price. *o* Per 60-lb. roll. *p* Tax included. *q* Per 90-lb. roll. *r* F.o.b. factory Chicago. *s* ASTM Spec. D266-41. *t* Federal tax included. *u* Per 90 lb. square. *v* Per ton. *w* Price to large paint contractors is $1.25 less. *x* Mineral surfaced. *y* 55-gallon container. *z* Drums. *aa* Approximate cost per 100 lbs. *bb* Roofers coating and cement. Price per ton. *cc* LCL, truck delivery. *dd* 2% cash discount. *ee* Asphalt in 100 lb. package. *ff* 5-gal. drums.

SKILLED AND COMMON WAGE RATES — PER HOUR

	Brick-layers	Car-penters	Struct. Iron Workers	Hoisting Engineers	Plas-terers	Electrical Workers	Steam-fitters	Common Labor — Building	Common Labor — Heavy Const.
Atlanta	$2.25	$1.775	$2.00	$2.00	$2.00	$2.00	$2.00	$0.75	$0.85
Baltimore	2.50	2.25	2.40	2.20/2.40	2.25	2.25	2.25	1.25	1.25
Birmingham	2.25	1.80	2.15	1.75/2.25	2.20	2.00	2.25	.95	1.05
Boston	2.50	2.10	2.40	2.45	2.50	2.30	2.30	1.55	1.55
Chicago	2.40	2.35	2.40	2.35	2.40	2.35	2.35	1.70	1.70
Cincinnati	2.50	2.20	2.35	2.50	2.375	2.375	2.35	1.46	1.46
Cleveland	2.375	2.325	2.375	2.25	2.375	2.375	2.375	1.725	1.40
Dallas	2.50	2.25	2.25	2.25	2.125	2.00	2.375	1.075	1.275
Denver	2.25*b*	2.10	2.00*b*	2.15*b*	2.25	2.25	2.24	1.40	1.35
Detroit	2.50	2.20	2.40	2.40	2.50	2.40	2.40	1.575	1.575
Kansas City	2.50	2.05	2.20	2.05/2.275	2.50	2.15	2.125	1.475	1.40
Los Angeles	2.625	2.0375	2.1125	1.9875	2.25	2.40	2.25	1.4875	1.4875
Minneapolis	2.25	2.05	2.175	2.00	2.35	2.21	2.25	1.45	1.45
New Orleans	2.05	1.75	2.00	1.625/1.875	1.875	2.00	2.25	.90	.90
New York	3.20*b*	2.75*b*	3.00	3.00	3.20*a*	2.50*a*	2.75*b*	1.70	1.70
Philadelphia	2.75	2.25	2.65	2.50	2.50	2.375	2.50	1.25	1.25
Pittsburgh	3.00	2.50	2.25	2.40	2.50	2.50	2.50	1.35	1.35
St. Louis	2.75	2.20	2.425	2.55	2.50	2.25	2.25	1.50	1.75
San Francisco	2.8125	2.16	2.25	2.125	2.25	2.25	2.25	1.525	1.525
Seattle	2.365	2.065	2.265	2.20	2.365	2.265	2.50	1.665	1.70
Montreal*	1.40	1.25	1.30	1.20	1.40	1.35	1.11	.94	.88

a 6 hr. day. *b* 7 hr. day. * Cost of living bonus now included in basic wage.

MEXICO CITY PRICES

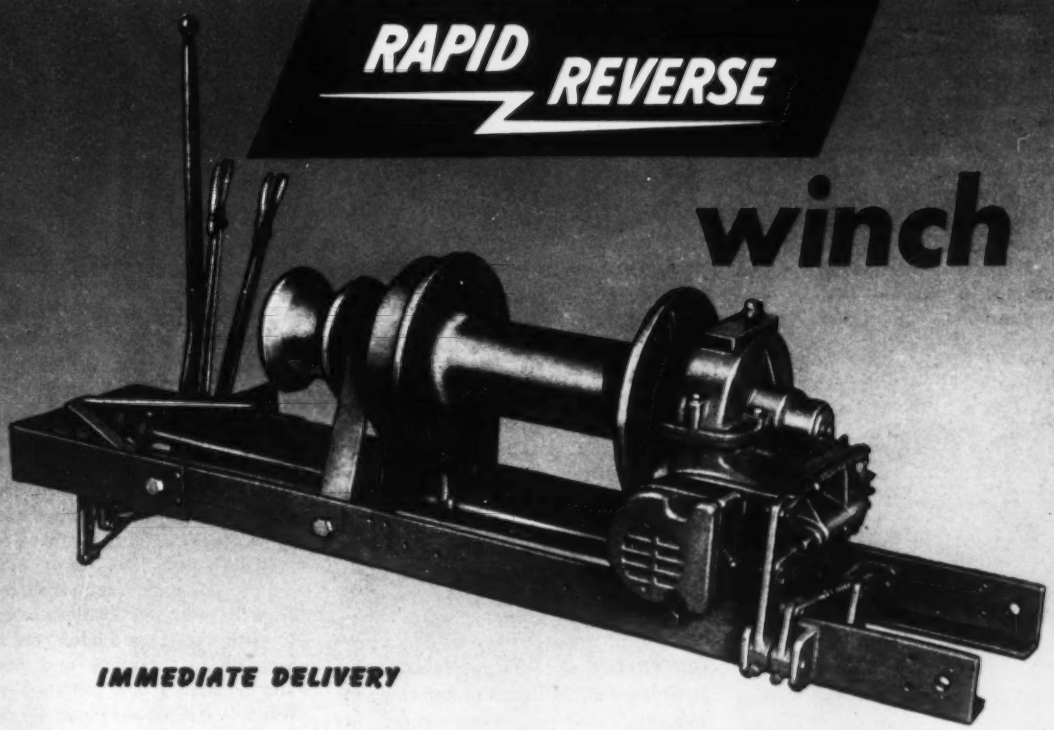
In Pesos, f.o.b. City		July '48	Aug. '48
Common Wages—Building (8 hr. day)	av. per hr.	.57	.57
Common Wages—Heavy Const. (8 hr. day)	av. per hr.	.75	.75
Skilled Labor Wages			
Carpenters (8 hr. day)	av. per hr.	1.25	1.25
Bricklayers (8 hr. day)	av. per hr.	1.25	1.25
Struct. Iron Workers (8 hr. day)	av. per hr.	1.50	1.50
Struct. Steel Shapes 3"-15" x 12 meters	per ton	800.00	1,300.00
Reinf. Steel, Corr. Rods ⅜" x 12 meters	per ton	950.00	1,140.00
½" x 12 meters	per ton	900.00	1,080.00
⅝" x 12 meters	per ton	880.00	1,056.00
¾" x 12 meters	per ton	850.00	1,020.00
⅞" x 12 meters	per ton	850.00	1,020.00
1" x 12 meters	per ton	850.00	1,020.00
Gravel, truck load of 3½ cu. meters			
Blue Gravel	per tr. load	32.00	32.00
Rose Gravel	per tr. load	30.00	30.00
Cement, Std. Port. (Toltecs)	per ton	115.00	115.00
Lumber			
Mex. Sacred Fir (Oyamel)	per M ft.	375.00	350.00
1st Class Pine	per M ft.	750.00	700.00
2nd Class Pine	per M ft.	600.00	550.00

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $2.318. **ENR Common Average:** $1.393

faster and safer LIFTING with the

GarWood

RAPID REVERSE winch



IMMEDIATE DELIVERY

TIME is saved. Hoisting, holding and paying out are all done under full load without declutching the engine or power take-off. The integral reverse gear mechanism provides instantaneous and complete winch action at all times. This is exclusive with Gar Wood.

SAFETY is promoted with built-in automatic safety brake on the worm, detachable back draft clutch, and full control of the load at all times. The high quality of all parts is important in the long life and dependable operation of all Gar Wood Winches. *Flexible mounting* is another exclusive Gar Wood feature . . . the constant flexing of the chassis is absorbed by this design, thus preventing cramped drums or distorted shafts.

The Rapid Reverse Winch is available from stock in two sizes having capacities of 20,000 and 30,000 pounds.

ASK FOR NEW BULLETIN W149-R

In addition to the Rapid Reverse Winch, this bulletin also illustrates and describes the many other types and sizes of Gar Wood Winches for all kinds of jobs.

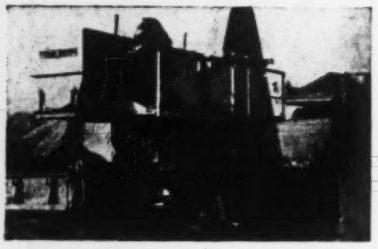
GAR WOOD GW INDUSTRIES

GAR WOOD INDUSTRIES, INC.

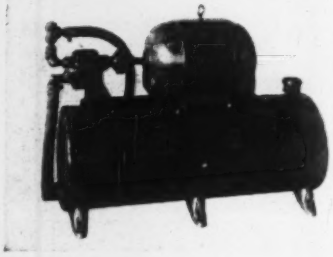
WAYNE DIVISION, WAYNE, MICHIGAN

PRODUCTS—HOISTS • DUMP BODIES • WINCHES • CRANES • TANKS • TRACTOR EQUIPMENT
DITCHERS • SHOVELS • FINISHGRADERS • SPREADERS • TRUCK PATROLS

NEW PRODUCTS



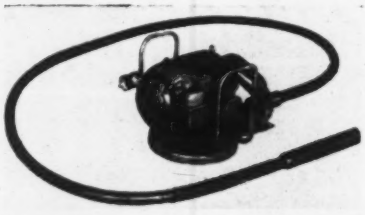
BITUMINOUS MIXING PLANT—A portable, continuous volumetric-type bituminous mixing plant with a 100 to 150-ton per hour capacity is built in two units on pneumatic-tired steel trucks. It can be set up permanently if desired. Steady flow of accurately mixed bituminous materials is assured by separate gradation and mixing units. Where specifications are not so complex, the mixing unit may be used alone.—*Iowa Mfg. Co., Cedar Rapids, Iowa.*



LOW COST POWER UNITS—Selling in the low price bracket, the "Cubline" power units open up broader fields for hydraulics application. Each of the 6-, 10-, and 15-gpm. units consists of a 35 gal. round oil storage reservoir with foot mountings; electric motor; 1,000 psi. gear pump, relief valve; coupling; pipe and fittings; suction hose and clamps.—*Hydraulic Press Mfg. Co., Hydro-Power Division, Mt. Gilead, Ohio.*

ARC-WELDING ELECTRODE — New low-hydrogen type coated electrode made to prevent under-bead cracking in weld deposits is called Airco No. 394. Operates on either a.c. or d.c. current and is designed to give welds of 100,000 psi. Recommended for fabrication of hardenable steels susceptible to under-bead cracking when conventional types of electrodes are used without preheat. —*Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.*

CLAY SPADE—Designed for easy holding and reduction of digging costs, Le Roi 31 clayspade weighs only 18 lb., and is short, 19 in. in length. Built-in oiling system includes large reservoir in handle from which oil is metered into live air stream and carried to every working part. Cylinder, handle and retainer have been forged to form a tough armor-clad, hard-working tool. Spacer and chuck bushings are renewable.—*Le Roi Co., 1706 S. 68 St., Milwaukee 14, Wis.*

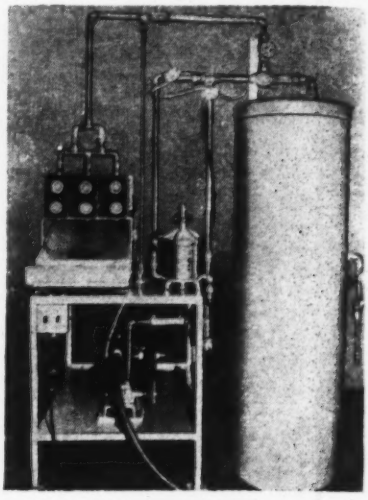


ELECTRIC POWERED CONCRETE VIBRATORS—Totally inclosed splash-proof electric motors, watertight control stations and cable connectors, adjustable ball-bearing countershafts, and 360-deg. swivel mountings are features of two concrete vibrators. Shafts from motors to vibrating heads come in sections that can be extended to 35 ft. Flat coils reinforce each end. Model HE has a full-load speed of 6,000 vibrations per min. and a 2½-in. head. Model JE6 has a speed of 7,600 vibrations per min. at full load and a 1½-in. head.—*Stow Manufacturing Co., Binghamton, N. Y.*

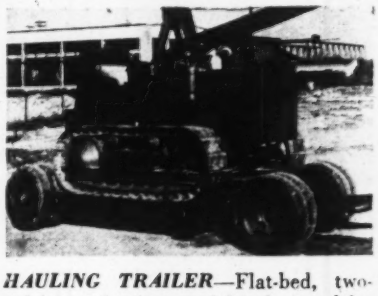
CENTRIFUGAL PUMP—New feature is high-speed, positive and non-clogging priming. Line as manufactured includes pumps with capacities ranging from 3,000 to 90,000 g.p.h. Free-passage vent located adjacent to periphery of impeller achieves speedy self-priming with as little as one-third normal water level in pump body.—*Barnes Mfg. Co., Mansfield, Ohio.*

TRENCHER—Hooked up to a Ferguson tractor, the Everett Mfg. Co's new trencher digs ditch 42 in. deep and 12 to 18 in. wide. Driven from power take-off of tractor, and raised and lowered by tractor's hydraulic control system. Has cast steel digging buckets with adjustable clearance teeth. Belt delivers excavated earth to side of trench. Can be moved from job to job under its own power or on trailer. Maneuvers quickly into working position. Has special transmission placed in its own gear box to provide for speed reduction necessary.—*Everett Mfg. Co. Inc., Phoenix, Ariz.*

JACK SUPPORT—Designed to replace wooden wedge supports and have upright or inverted use, an aluminum alloy jack support, JS-1, weighs 8¾ lb. Jack is 15 in. high, has a 7x10-in. platform.—*Templeton, Kenly & Co., 1020 S. Central Ave., Chicago 44, Ill.*



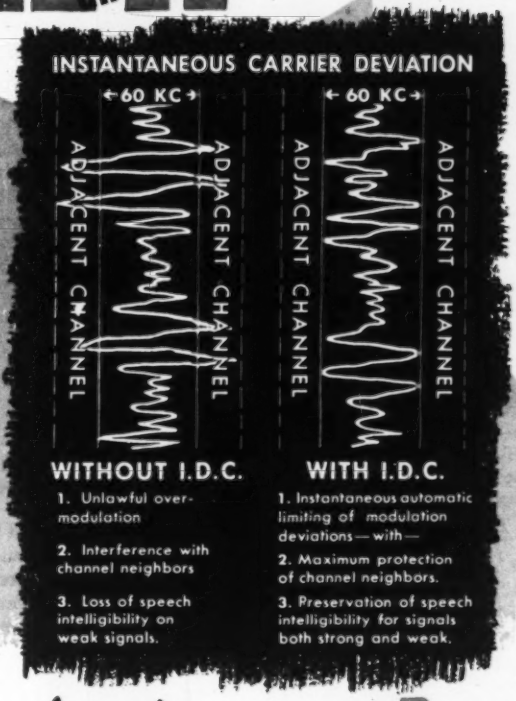
HYDROZONE WATER PURIFIER—This 600-gph. water purification plant is self-sufficient as no adjustments are needed to provide the purification dosage. All that is required to operate it is to connect 220 volts, 60 cycle, single or 3-phase current to the operating switch on the ozonator panel, drop the suction line to the pump into the stream, cistern, tank or raw water line and throw the switch. Ozone is the purifying medium. The manufacturer claims this unit will remove all chlorine, sulphur and phenol tastes and odors and deliver pure, clear, sparkling and healthful water no matter how contaminated the source. — *Hydrozone Corp. of America, 1 Montgomery Street, Jersey City, N. J.*



HAULING TRAILER—Flat-bed, two-axle, front-loading model is designed for moving many types of construction equipment and materials. Features include low loading height (under 24-in.) sturdy construction, even weight distribution, generous-sized tires, and four-wheel electric brakes. Two adjustable feet, one on each front corner, controlled by a built-in, hand-operated hydraulic jack permit easy removal and replacement of front axle and tongue.—*Cleveland Trencher Co., 20,100 St. Clair Ave., Cleveland 17, Ohio.*

NEW

another sensational first for Motorola research laboratories



I.D.C.

instantaneous deviation control

For the first time the deviation will be coordinated with the receiver bandpass to insure the greatest possible speech intelligibility on weak received signals.

Instantaneous Deviation Control

FM modulation control problems can *not* be solved by *Speech clippers, compressors* or *a.v.c. circuits* only. I.D.C. provides the fundamental scientific solution by controlling the steepness of the modulating wave front. Only by means of this instantaneous slope limiting action can *unlawful* excessive deviation be prevented.

I.D.C. improves system operation and answers the F.C.C. proposed regulations for channel-neighbor protection.

WRITE TODAY

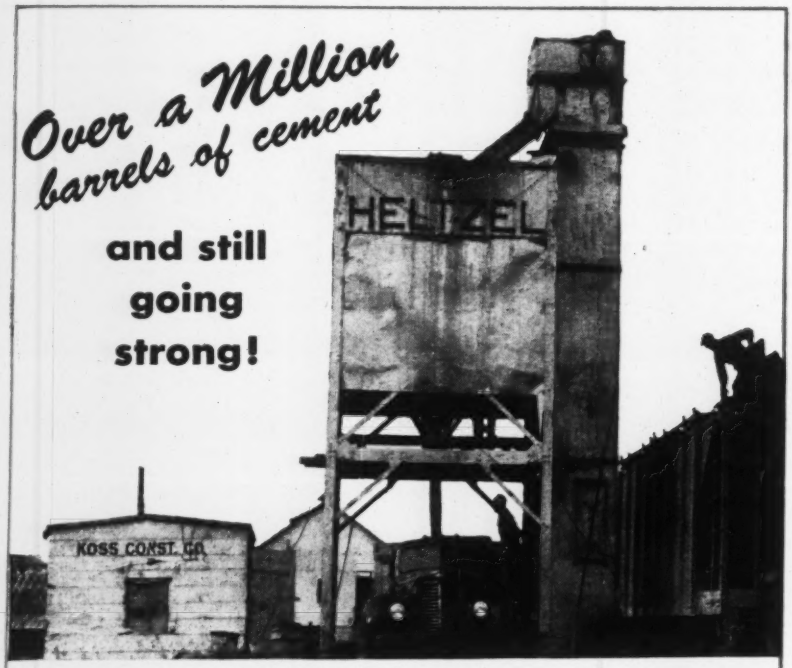
Your Motorola Communications Engineer will call to discuss the use of the new Motorola I.D.C. in your communications system. No obligation, of course.

Motorola FM 2-WAY RADIO

Motorola Inc. COMMUNICATIONS DIVISION, 4545 AUGUSTA BLVD., CHICAGO 51, ILL.
Canadian Distributor
ROGERS MAJESTIC LTD., TORONTO - MONTREAL

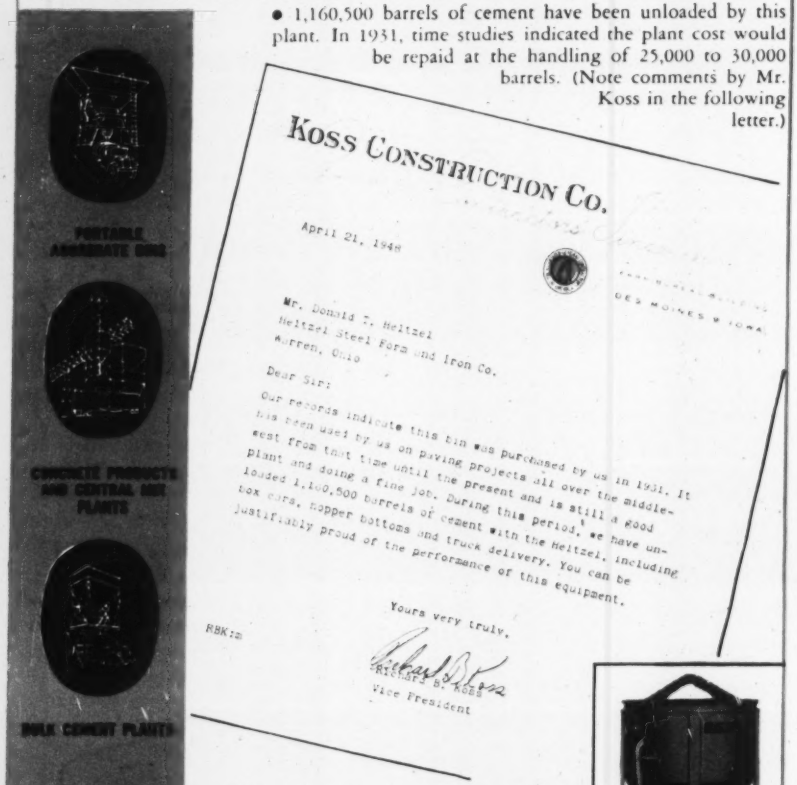
Over a Million barrels of cement

and still going strong!



VETERAN HELTZEL PLANT HAS REPAID ITS COST 42 TIMES OVER IN 17 YEARS . . .

• 1,160,500 barrels of cement have been unloaded by this plant. In 1931, time studies indicated the plant cost would be repaid at the handling of 25,000 to 30,000 barrels. (Note comments by Mr. Koss in the following letter.)



KOSS CONSTRUCTION CO.

April 21, 1948

Mr. Donald T. Heltzel
Heltzel Steel Form and Iron Co.
Warren, Ohio

Dear Sir:

Our records indicate this tin was purchased by us in 1931. It has been used by us on paving projects all over the middle-west from that time until the present and is still a good plant and doing a fine job. During this period we have unloaded 1,160,500 barrels of cement with the Heltzel, including box cars, hopper bottoms and truck delivery. You can be justifiably proud of the performance of this equipment.

Yours very truly,

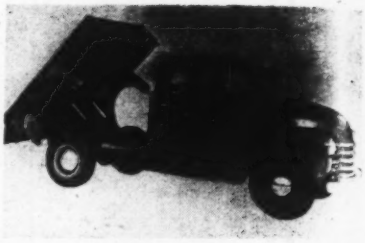
RBK:m

Richard B. Koss
Vice President

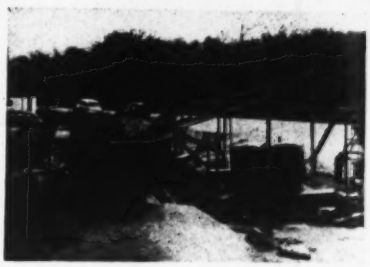
Heltzel plants are products of specialized engineering, and constructed for lasting, trouble-free service. Your requirements for plants will be served best by Heltzel. Write for information and literature.

CONCRETE BUCKETS

HELTZEL STEEL FORM & IRON CO. WARREN, OHIO · U. S. A.



TWIN HOIST PICKUP DUMP—Controlled by a finger-tip lever in the cab, a fully automatic, hydraulically operated, twin hoist dump body can be installed on nearly all makes and models of ¾ and 1-ton pickup trucks. The twin hoist unit has a rated lifting capacity of 3 tons with a wide overload safety factor. The single hoist unit for ½-ton pickups has a rated 1-ton capacity.—*National Truck Equipment Co., Dept.* 441, *Waaukesha, Wis.*

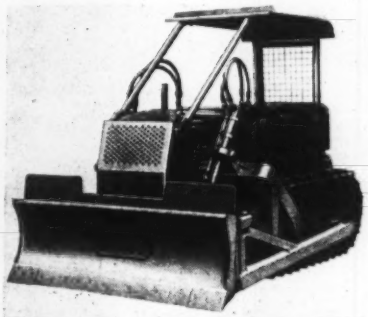


LARGE CAPACITY PULVERIZER — Limited only by the operator's capacity to feed stone fast enough, a large capacity pulverizer produces 170 or more tons of ag-lime per hr., 90-100 percent passing 8 mesh screen. Feed opening 22x50 in. permits passage of large rocks for primary crushing, and the 32x48-in. machine requires 320 hp. to produce above capacities.—*Lippmann Engineering Works, Milwaukee, Wis.*

SPREADER — Designed for applying cover stone on seal coat work, a spreader has built-in trailer equipment and may be changed from trailing to spreading positions by one man. Other features are a conveyor-agitator with clutch, and folding platforms for the operator.—*W. E. Grace Mfg. Co., Dallas, Tex.*

INCREASED HORSEPOWER RATINGS—Design of the TD-14 and TD-18 Diesel crawler tractors has been

changed to give increased horsepower ratings. The TD-14 now develops 72 hp. at the flywheel, 68 belt horsepower, and 57 drawbar horsepower at 1400 rpm. At 1300 rpm., the TD-18 develops 97 hp. at the flywheel, 91.5 belt horsepower and 80.5 drawbar horsepower. Compression ratio of both engines is 15½ to 1. Intake and exhaust manifolds are mounted on opposite sides of the engine, and new fuel injection systems are featured by both models.—*International Harvester Co., Industrial Power Division, Chicago, Ill.*



HYDRAULIC DOZERS—Built to fit the largest crawler tractors, straight and angle-blade Hydradozers feature a front-mounted, closed hydraulic system with pump, control valve and reservoir, in one unit. Moldboard has maximum tilt of 18 in. from horizontal, and angle of cut or pitch has a 10-deg. adjustment from normal. Large bearing surfaces on the two-way side frame trunnions take up side-frame twist, hold moldboard tilt solidly, and minimize wear. Cylinders are mounted on a universal trunnion bracket.—*Pacific Car and Foundry Co., Renton, Wash.*

FOUR-WHEEL SCRAPER — Cable-controlled unit of 7.6 cu. yd. heaped capacity is designed for use with 55- hp. tractor. Model 508 takes a deep cut 12 in. below tires and cascades earth into bowl which is of pivoted type. Specifications include: over-all width, 8 ft. 10 in.; wheel base, 14 ft. 6 in.; over-all length including drawbar, 23 ft. 6 in.; bowl width inside, 7 ft. 6 in.; depth of spread above tires, 18 in.; bowl clearance raised for hauling, 18 in.; apron opening, 36 in.; weight, scraper only, 10,200 lb.—*Gar Wood Industries, Inc., Wayne, Mich.*

TOWING WINCH — Designed to meet increased horsepower of the Caterpillar D2 tractor, the D2N towing winch is direct-geared, reversible

Ask for

Briggs & Stratton

Gasoline Engines

on the equipment

You buy

More and more Briggs & Stratton Engines are now available on all types of appliances and equipment than ever before.

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Milwaukee 1, Wis., U. S. A.

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BRIGGS & STRATTON

GASOLINE ENGINES

Preferred Power FOR INDUSTRIAL CONSTRUCTION RAILROAD AND FARM EQUIPMENT

How to put faraway suppliers close to "home"

What if suppliers *are* thousands of miles away? When you specify Air Express, you cut down delivery of equipment, supplies and finished products to a matter of hours. Air Express is the *fastest service* there is. Remember—large inventories are expensive. You can keep them low by getting what you need in hours.

Air Express goes on every flight of the Scheduled Airlines—places the most distant suppliers only hours away. And you get fast pick-up and delivery service at no extra cost. Rates are *low*. Use Air Express regularly and keep things hustling.

Specify Air Express-World's Fastest Shipping Service

- Low rates—special pick-up and delivery in principal U. S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.

True case history: Sacramento, California, dairy regularly gets replacement parts and equipment by Air Express. Keeps inventory low—gets things in hours. Typical shipment: 32 lbs. of parts picked up in Detroit 7 P.M., in use at Sacramento next afternoon. 2039 miles, Air Express charge $19.65. Any distance similarly inexpensive. Phone Air Express Division, Railway Express Agency, for fast shipping action.

AIR EXPRESS

GETS THERE FIRST

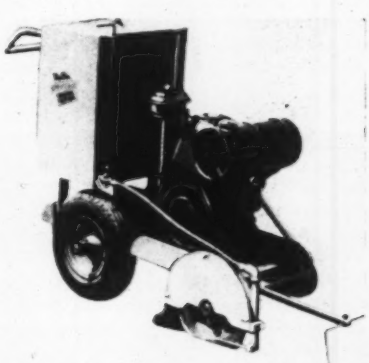
Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE

SCHEDULED AIRLINES OF THE U.S.

and operates in complete oil bath lubrication. With a power take-off available, the D2N has a line pull up to 13,400 lb. and improved handling gear design.—*Hyster Co., Portland 8, Ore. or Peoria 1, Ill.*

ALL-PURPOSE TOOL KITS — Designed for construction men, compact and portable tool kit permits drilling of steel, masonry and wood, nut and bolt running and removal and screw driving and removal, all with a single tool, the Ingersoll-Rand electric impact tool. By using standard accessories, tool performs a multitude of jobs easily and quickly, such as wire brush, apply and remove studs, tap, ream, extract broken cap screws and studs and do whole saw work. Kit contains impact tool with Jacobs collet-type chuck, six hex sockets of various sizes, a Morse taper socket and adapter sleeve. Tool plugs into any ac.-dc. electric socket and runs as any conventional electric tool until the going gets tough; then the impact mechanism automatically functions and delivers 1,900 rotary impacts per min. Available with either 110 or 220-v. motors as required.—*Ingersoll-Rand Co., Phillipsburg, N. J.*



CONCRETE CUTTER—Cutting speeds up to 60 in. per min., sharp, straight edges and 90°-angle corners are possible with the Stratedge Concrete Cutter. The

a hard "hide"... AND TOUGH CLEAN THROUGH!

LAMSON "1035" SET SCREWS

HERE'S THE *Big* DIFFERENCE

Ordinary Set Screws

HARD EXTERIOR — SOFT CORE — SOFT CORE MAY TWIST OFF UNDER HIGH TORQUE

Lamson "1035" Set Screws

HARD EXTERIOR — TOUGH CORE — SET SCREWS WON'T BREAK OFF WITH THIS TOUGH, HEAT TREATED CORE

YOU CAN'T JUDGE a set screw by its "skin" alone. You've got to get *below* the surface to determine real set screw quality.

Through a series of special heat treatments, Lamson "1035" Set Screws attain not only a high surface hardness but also a rugged toughness *all the way through.* This results in the ideal combination for a set screw: (1) outer hardness which provides a sharp "biting" surface at the point and (2) internal toughness that will withstand heavy compression and prevent heads or shanks from twisting off under high torque.

For the majority of set screw applications, Lamson "1035's" will perform as satisfactorily as the highest priced alloy product; yet THEY SELL FOR THE SAME PRICE AS COMMON, ORDINARY SET SCREWS.

Lamson "1035" Set Screws are available in a full range of commercial sizes.

So why not get premium quality without paying a premium price? Specify Lamson "1035" Set Screws for *double value:* a hard "hide" and toughness *all the way through!*

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As a guarantee of the proper and successful completion of a construction project, this statement has real significance for the owner, contractor, and the general public. It both certifies the contractor's capacity and resources to handle the job and gives assurance that he is backed by the Hartford's financial security and long experience in the contract bonding field.

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cutter is equipped with a 6 hp. engine and specially-designed diamond saw. It is easily transported and operated by one man.—*Becklin Products Co., Burlington, Wis.*

NEW CHAIN SAW FEATURES—Two new features in engine and tail stock assemblies of Disston chain saw include automatic chain lubricator and a simplified "cradle balanced" tail stock. Chain lubricator on engine is designed to make volume of oil to chain entirely automatic and of sufficient pressure to prevent clogging of line by sawdust and other foreign matter. Pump operates in any position and flow is automatically shut off when chain is not running. Tail stock has been completely redesigned and made smaller without sacrificing strength. Narrower lines make it easier to handle. Use of aluminum alloy makes for greater rigidity and reduced size in tail stock. Tail stock is cradle-balanced and shaped to fit into operator's arm. Operator can use body of tail stock as fulcrum for maneuvering saw in cut. New tension adjustment makes it possible to alter tension of chain through wide range—*Henry Disston & Sons, Inc., Unruh and Milnor Streets, Philadelphia 35, Pa.*

VISE PLIERS—Finger tip release, one flat and one curved jaw, and a double-action adjusting screw on "Gripso" vise pliers make them adaptable for many different uses. The adjusting screw, which employs both left and right-hand threads to cut adjusting time, and finger-tip release can both be operated with one hand.—*H. R. Basford Co., San Francisco, Calif.*

HEAT GENERATOR DISPENSOR—A portable, steam or hot water generator and dispensor is useful for thawing out materials; creating suitable temperatures for painting, pouring concrete, etc.; and various other purposes. Requiring no regular attendant the Eco-

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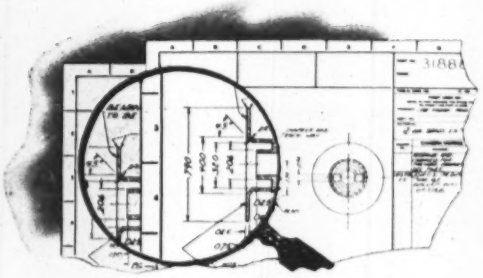
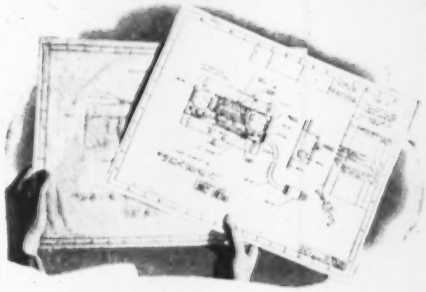
intermediate paper gets more out of every drawing





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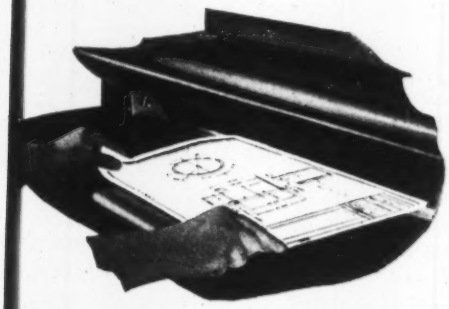

Gives more . . . on present equipment . . . Kodagraph Autopositive Paper is easy to use. Nothing new to buy . . . it prints direct-to-positive . . . in ordinary room light . . . on regular blueprint or direct process equipment or in a vacuum frame. Nothing new to learn . . . simple photographic processing—no darkroom—no negative step. What's more, finished intermediates are tough, long-lasting . . . deletions, drawing-board changes are readily made, redrafting costs kept to a minimum.

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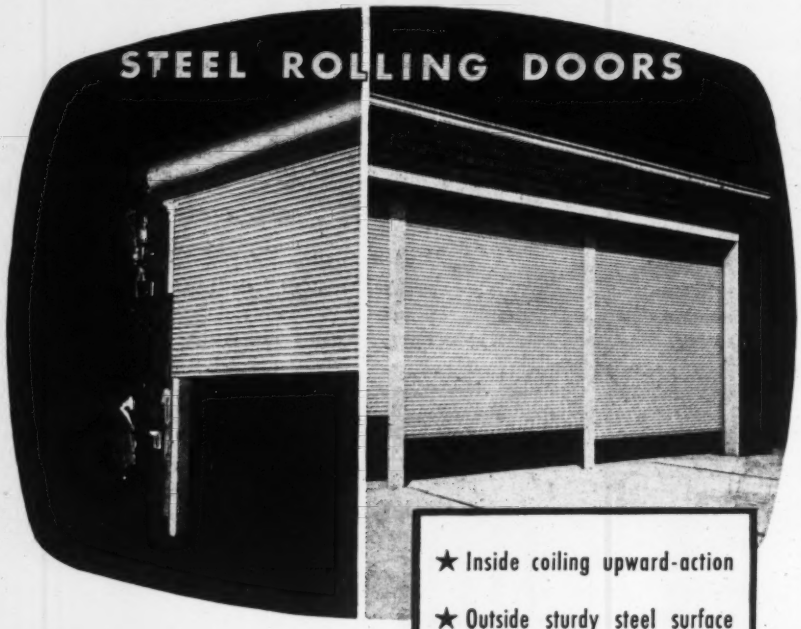

★ Inside coiling upward-action
★ Outside sturdy steel surface
★ Inside space-saving features
★ Outside unobstructed opening
★ Inside easy-to-reach control
★ Outside attractive appearance

When you're deciding on doors, consider the many advantages on *both sides* of Kinnear Steel Rolling Doors. Inside and outside, you have full use of all wall and floor space at doorways. The *interlocking-slat* steel curtain rises *straight upward;* opens and shuts smoothly and easily. It coils in a compact roll above the doorway, completely out of the way; out of reach of wind or vehicle damage. When shut, Kinnear Rolling Doors are all-metal barriers against fire, storm, theft, and intrusion.

These rugged Kinnear Rolling Doors give long-time, low-maintenance service. Their modern straight-line design blends with all architectural styles. They are individually engineered to fit any size opening in new or old structures. For fullest operating ease and time-saving convenience, install Kinnear Rolling Doors with instant-acting Kinnear Motor Operators and push-button controls. (Manually operated doors easily motorized, too.)

Inside and out, Kinnear Rolling Doors combine all features that save manpower, reduce heating and air-conditioning costs by promoting prompt door closure, and extend plant efficiency right up to the doors. Write today for details.

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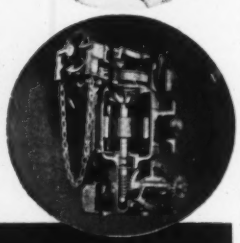

Husky KINNEAR Motor Operator lifts, lowers, stops door electrically.

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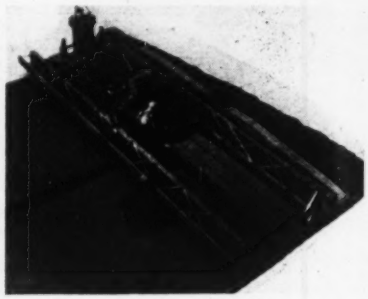
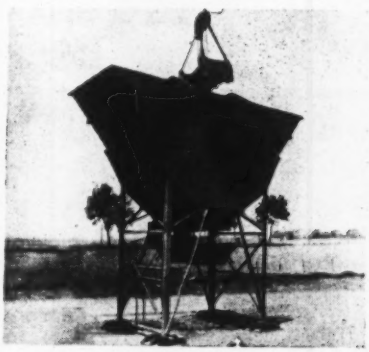
Temp unit needs only a 110-v., 60 cycle, single phase outlet, a smoke pipe opening and a water hose. The tank holds 30 gal of No. 2 fuel oil and burns only 1½ gal. per hour. Eco-Temp comes mounted on rubber-tired casters.—*Arthur C. Baumann, 7011-21 Grays Ave., Philadelphia 42, Pa.*

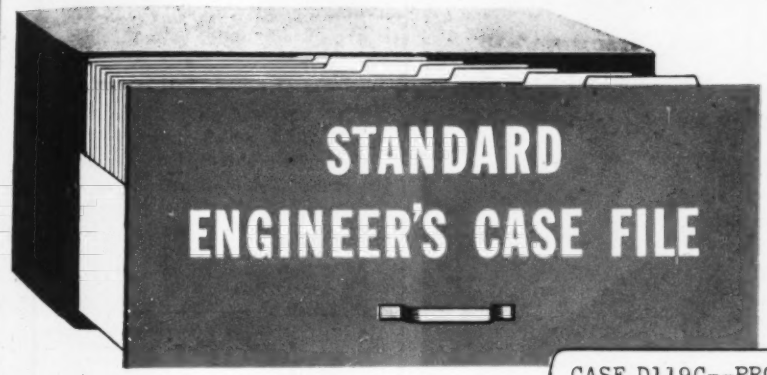


HIGHWAY COMBINATION MACHINE—Automatic spray curing, brooming, belting, burlap dragging, and traffic line installation are accomplished, any three at a time, by a combination machine. Easily interchangeable, attachments are installed on the basic automatic spray machine. The combination machine is available in standard widths, 10-12½ ft. and 20-25 ft., and in special widths on request.—*Flex-Plane Co., Warren, Ohio.*

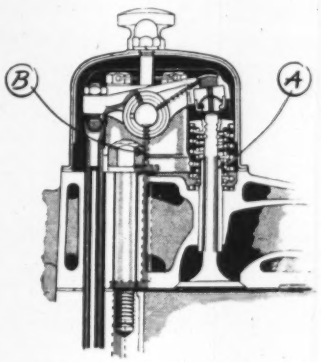


AGGREGATE BIN—Available for use with one or two Hi-Speed multiple material batchers, the low, 11-ft. wide aggregate bin has 50 deg. bottom slopes. The 120 and 125-cu.yd. sizes ship in only two main sections and smaller sizes in one piece, enabling fast erection. Steel-frame mat assemblies eliminate the need for concrete footings on temporary set-ups, and the bin converts into a low-cost ready-mix plant with the substitution of long leg and cement roof sections and a truck-mixer weigh hopper.—*C. S. Johnson Co., Champaign, Ill.*

HAND WELDING SHIELD—Recommended where a welding helmet is not practical, a lightweight, seamless hand welding shield is available with Noviweld or Filterweld glass plates which insure eye protection. Glass holder is



CASE D119C--PROVIDING GOOD VALVE ACTION IN DIESEL ENGINES.



DIESEL ENGINE VALVE ASSEMBLY

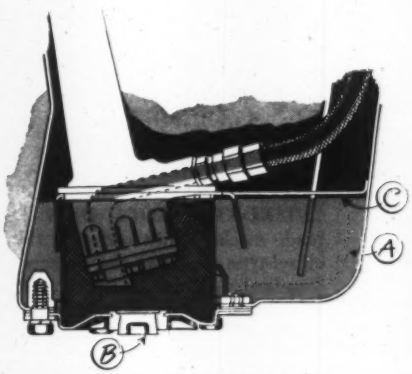
When Diesel engines, operating in tough heavy-duty service, were lubricated with compounded RPM DELO Diesel Engine Lubricating Oil, valve stems and guides did not gum up. They received thorough lubrication at all times and wear was negligible. RPM DELO Oil is recommended for all types of Diesels. Comes in several viscosity grades to meet all conditions.

A. Specially selected oxidation-resistant base stocks and special compounds prevent formation of gum and lacquer . . . oil film adheres to hot or cold metal surfaces.

B. Detergent compound keeps oil passages clean and open . . . and allows free flow of adequate supply of lubricant to wear points.

RPM DELO Diesel Engine Lubricating Oil is non-corrosive to all bearing metals. This quality and high stability assure sound bearings in Diesels for long service periods.

CASE D119D--KEEPING PARTS CLEAN AND REMOVING CONTAMINANTS FROM DIESEL ENGINES.



DIESEL ENGINE CRANKCASE

Cylinder walls, pistons, bearings and other parts of Diesel engines in heavy-duty service remained free of lacquer, and all contaminants flowed out with drainings when RPM DELO Diesel Engine Lubricating Oil was used.

A. A special compound in RPM DELO Oil loosens and removes lacquer and other deposits from parts and oil passages . . . and they stay harmlessly dispersed in the oil.

B. The finely dispersed contaminants, including condensate and dust, flow out freely when crankcases are drained.

C. Another compound in RPM DELO Oil prevents foaming —allows accurate measurement of oil levels and delivery of sufficient lubricant by oil pumps.

The engine-cleaning qualities of RPM DELO Oil help reduce wear on parts and prolong greatly the operating periods between engine overhauls.

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NEW DIXIE PORTABLE WATER CARRIER

Well built for hard use in the field. Insulation keeps 4 gals. cool for hours. Write for descriptive folder. Dixie Cup Company, Easton, Pa.

When a man drops his tools to forage a drink, the time-loss comes out of your pocketbook. You plug this waste when Vortex* or Dixie* Cups deliver cool, *clean* water right where he's working. You also guard him against exposure to mouth-carried infections—help keep him well and on the job.

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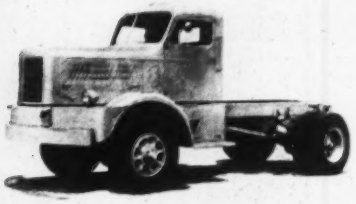
DIXIE CUP

insulated and rivetless. The fibre-handle is 5½ in. long, and, without glass, the entire shield weighs only 11 oz.—*American Optical Co., Southbridge, Mass.*



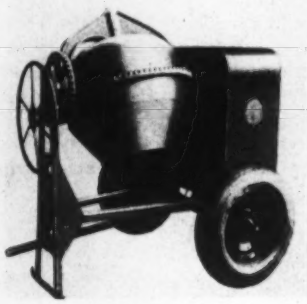
HEAVY-DUTY TRUCK — Rated at 33,000 lbs. gross vehicle weight, the model ZU truck develops 188 hp. at 2060 rpm. governed speed and and 460 ft. lbs. of torque at 1000 rpm. An all-steel cab provides 30 percent greater visibility and greater driver comfort, and hood and fender skirting provides the serviceman with a firm catwalk. The frame is of 10x3x11/32-in. heat treated channel steel with welded and reinforced front cross member. Easy shifting and quiet operation are provided by a constant mesh transmission with helical gears and sliding jaw clutches.—*Four Wheel Drive Auto Co., Clintonville, Wis.*

CHISEL-TYPE ROCK BITS—With a blade mechanically seated in the body, chisel-type rock bits can be screwed on standard drill rods. Braze strains are eliminated by the new seating method, and water ports in both bevels give positive circulation. Bits come in sizes of 1⅜, 1½, 1⅝, 1¾, 2, and 2¼ in. with a shouldered contact between bit body and drill rod. Drilling speeds and life of bit are increased. No conversion of existing equipment is necessary in using the bit.—*Kennemetal Inc., Latrobe, Pa.*

DRAFTING MACHINE—An "Equipoise" mechanism which insures accurate alignment even when the drawing board is inclined as much as 20 deg.

is an important feature of the standard and civil engineer's drafting machines. Included in the new design are a revised protractor head assembly, a relocated base line setting device for locking the protractor index point to any angle, and an increased distance between clamp screws, holding drafter securely to board. —*Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill.*

ALUMINUM WINCH FOR SCAFFOLD — Saf-T-Swing stage includes two winches (each with attached stirrup and 150 ft. of steel cable) guard rail and center post. Platforms up to 2½ x 20 ft. in size may be employed. Loading up to 25 lb. per sq. ft. is safely handled with rated capacity of 625 lb. per winch. Simple two-way crank operation permits raising or lowering platform at rate of 20 ft. per min. Units weigh only 55 lb. each. Winch drum, frame, crank handle and stirrup are all aluminum. Gear and brake mechanism is entirely inclosed to exclude foreign matter. A 3-in. rubber roller is mounted on the inside edge of the stirrup to prevent walls being marred by scaffold.—*Saf-way Steel Products, Inc., Milwaukee 13, Wis.*



HALF-SACK CONCRETE MIXER— Rated at 3½ cu.ft. plus 10 percent capacity, the model 35-25UR gasoline engine driven concrete mixer is mounted on a high-speed trailer with pneumatic tires. The mixer includes a heavy semi-steel cast bowl and yoke, mixing blades designed for fast action, and a tilt gear for two-side pouring. Tow tongue is retractable. — *Vanco Products, Inc., Colorado Springs, Colo.*

ELEVATING CEMENT CHARGER — Used as a portable plant for unloading cement from box cars or hopper bottom cars, an elevating cement charger can be moved and set-up without auxiliary equipment. A standard dump truck transports and is employed in creating the one-piece unit. Standard equipment includes gasoline engine or electric drive, a 1000-lb. capacity weigh batcher, box car receiving hopper, a 10-in. dia. adjustable height screw conveyor and

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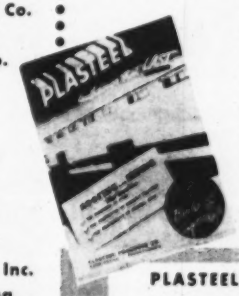

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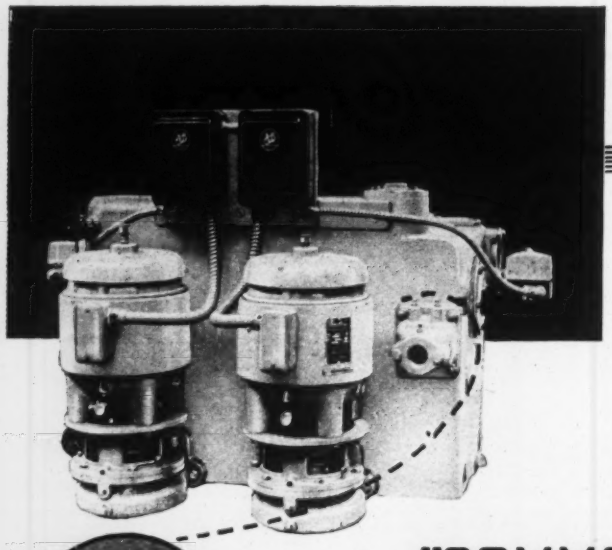

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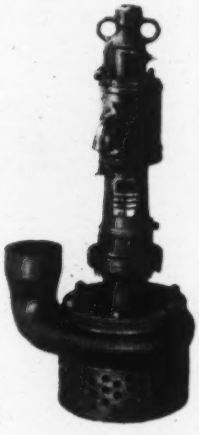
a small air compressor for cement aeration. Capacity is 300 bbl. per hr. with buckets 80 per cent filled.—*C. S. Johnson Co., 3024 W. Concordia Ave., Milwaukee 10, Wis.*



PNEUMATIC SPONGE PUMP — A high-head "mopping up" pump handles sand, pulverized rock, etc., passing solids up to 5/8 in. Lowest operating liquid level is within 3 in. of the sump base. Furnished in single or two-stage construction, the latter can be separated for lower head service or used as two pumps in parallel. Operated by a variable-speed motor and having impellers mounted at the extreme lower end, the pump's capacity range at 90 psi. is 25 to 300 gpm.; head range is 25 to 300 ft.—*Byron Jackson Co., Pump Division, Box 2017 Terminal Annex, Los Angeles 54, Calif.*

HAULING UNIT—Heaped load capacity of 12 cu.yd. and rugged construction are combined in the Diesel-powered Rocktor, a heavy-duty off-road rock hauling unit. The 150-hp. engine develops 5 forward traction speeds up to 30.1 mph. and 2 reverse speeds. Other features include controlled high-speed dumping, all-welded and reinforced body, free oscillating, steering axle, constant mesh transmission and twin-lever steering gear with hydraulic booster. The 10-ft. wide dump body, rocker mounted, is boosted to 70-deg. dump position by double-acting twin hydraulic cylinders. A 135-in. wheel base permits 26-ft. turning radius.—*Koehring Co., 3026 W. Concordia Ave., Milwaukee 10, Wis.*

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YOU remember only too well how a job like this used to be handled. It meant a small mixer, small capacity, perhaps shooting towers or lots of concrete buggy work, perhaps a crane and lots of false construction.

Look at this job. A MultiFoote 34-E with the elevated boom. The elevated boom puts the concrete up over 23 ft. with the bucket doors clear. The MultiFoote travels along the forms to reach any spot on the job — no extra equipment, labor cut to the minimum, no unnecessary false work or ramp construction.

Your MultiFoote and the MultiFoote Elevated Boom means new versatility both on highway work and general concrete construction. Let us give you complete details. Two sizes: 34-E Single Drum and 34-E Duomix (double drum). Remember there are more MultiFoote Pavers in service than any other make.

Ask about the Adnun Black Top Paver, the only paver of its kind that will lay black top, stone and cinders.

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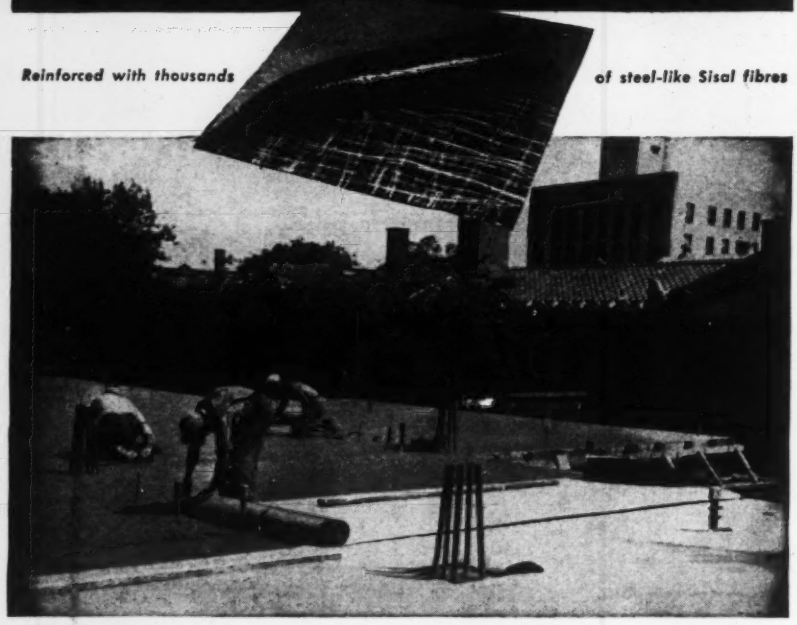
ADNUN BLACK TOP PAVERS
Kinetic ASPHALT MIXERS

MAXIMUM PROTECTION MINIMUM COST with SISALKRAFT

Reinforced with thousands of steel-like Sisal fibres



SISALKRAFT used for curing and protection of concrete floors of multi-story building

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SISALKRAFT is so strong it furnishes positive protection from debris and construction stains, and prevents marring. It also affords dependable frost-protection. It is so light-weight, it can be rolled into place easily and be removed quickly. Economical . . . can be used many times over.

The SISALKRAFT Method of curing and protection is used not only on buildings of concrete construction, but also, in a big way, on concrete highways. This modern method is automatic . . . no watching, no sprinkling, no other covering. The SISALKRAFT Method is a "natural" for you on single-story and multi-story jobs . . . also for driveways, sidewalks and roads. For complete data write Dept. ENR.

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Manufacturers' Publications

Hydraulic System Solvent—A bulletin describes Hydro-Solv "A"—a new product for removing gum, sludge and other efficiency-reducing contaminants from hydraulic systems. The product is also recommended for cleaning gear units.—*Swan-Finch Oil Corp., 30 Rockefeller Plaza, West, New York 20, N. Y.*

Compressors—Three new catalogs have been issued by the Jaeger Machine Co.: Catalog No. JC-8 covers new standard "Air Plus" compressors; catalog TM-8 covers Jaeger Hi-Dump truck mixer, and catalog M-8 covers trailer mixers.—*Jaeger Machine Co., 550 W. Spring St., Columbus 16, Ohio.*

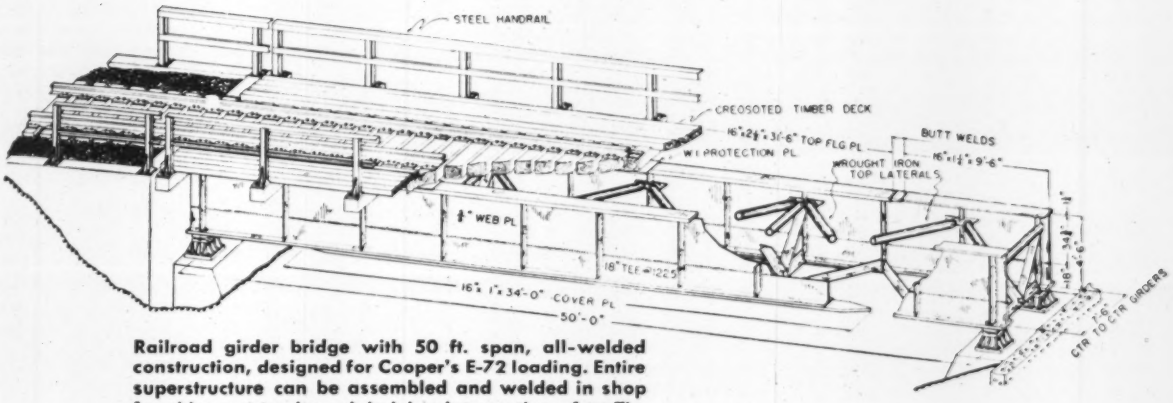
Public Opinion—"Creating favorable public opinion for water supply systems" is the title of a booklet prepared by the Cast Iron Pipe Research Association for distribution to waterworks superintendents, mayors, city managers and other city officials. It presents facts about public water supply, with cartoon illustrations, and contains suggestions on the preparation of speeches, newspaper publicity or advertisements and other matters.—*Cast Iron Pipe Research Association, Peoples Gas Bldg., Chicago, Ill.*

Public Utilities—Increasing efficiency for the public utility operator is the principal topic of "Public Utilities and the Caterpillar Diesel Power That Serves Them." The publication highlights the many uses of "Caterpillar" diesels to fill power needs of public utilities.—*Caterpillar Tractor Co., Peoria 8, Ill.*

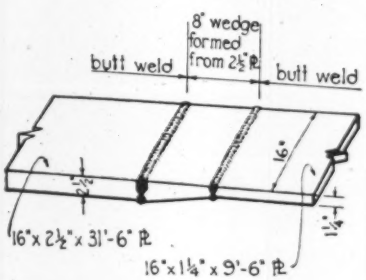
Design Data—(19-p. booklet) A new bulletin, No. 27, is titled "Design Data Formulas and Charts for Computing Maximum Stresses in Angles, Ribbed Plates, and Shear Resistant Webs Containing Cut Outs." This is the second booklet resulting from extensive design research and contains formulas and charts on the subject. The booklet is accompanied by a supplement that provides typical examples of applications of the data with specific references to the bulletin contents.—*Meehanite Metal Corp., Pershing Square Building, New Rochelle, N. Y.*

Paver Catalog—Single and double drum pavers with automatic control are described in this catalog. Other developments described and illustrated are: fast loading skip, boom, blading, dis-

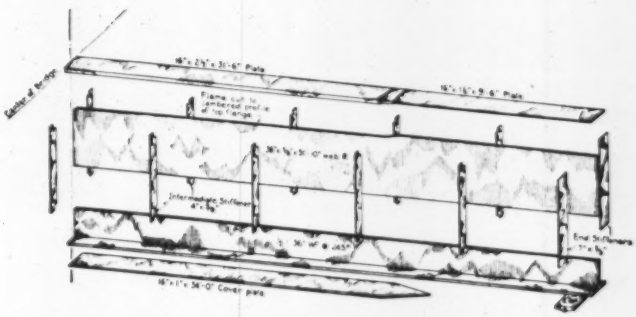
How to build an open deck railroad girder bridge



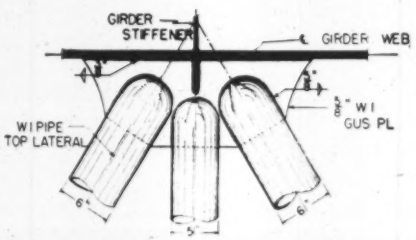
Railroad girder bridge with 50 ft. span, all-welded construction, designed for Cooper's E-72 loading. Entire superstructure can be assembled and welded in shop for shipment to site, minimizing interruption of traffic.



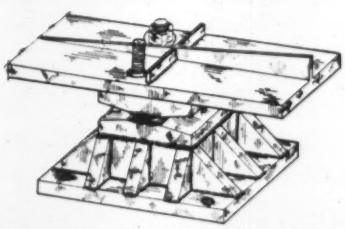
Tapered section inserted near ends of top flange for smooth transition of stresses.



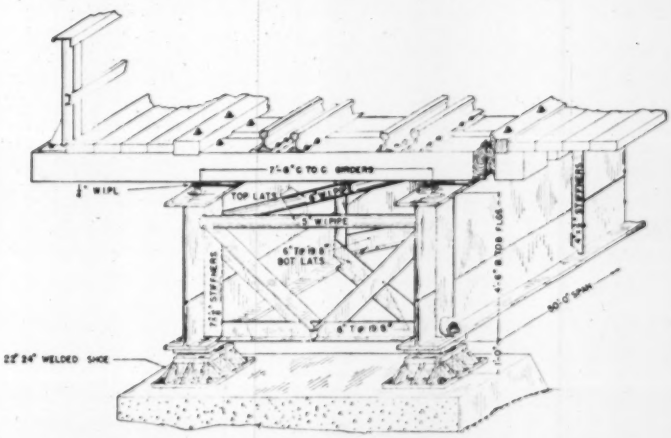
Bottom flanges are made from half of 36" WF 245 lb. beam, web split down middle, flange reinforced with 16" x 1" plate as shown.



Top lateral diagonals are wrought iron pipe, ends slotted and welded to gusset plates. Ends are "orange peeled" and welded tight to seal them from moisture.



Pedestal shoe consists of series of flame-cut crossed web plates. Bearing surfaces are made from weld deposit of chrome nickel steel.



Bottom laterals are made from 6" x 6" tee sections, joined by butt welding horizontal legs to edges of girder flange and fillet welding vertical legs to girder web. This view shows end of span.

The above is published by LINCOLN ELECTRIC in the interests of progress.
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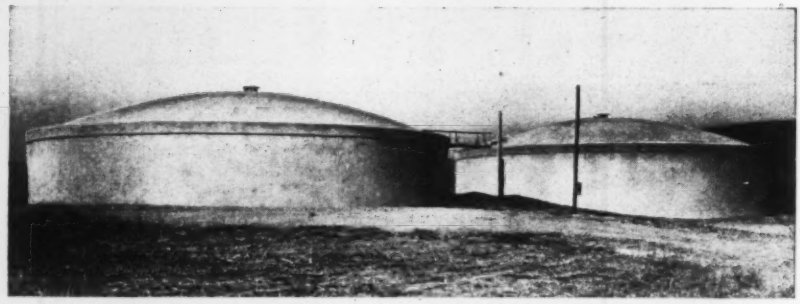

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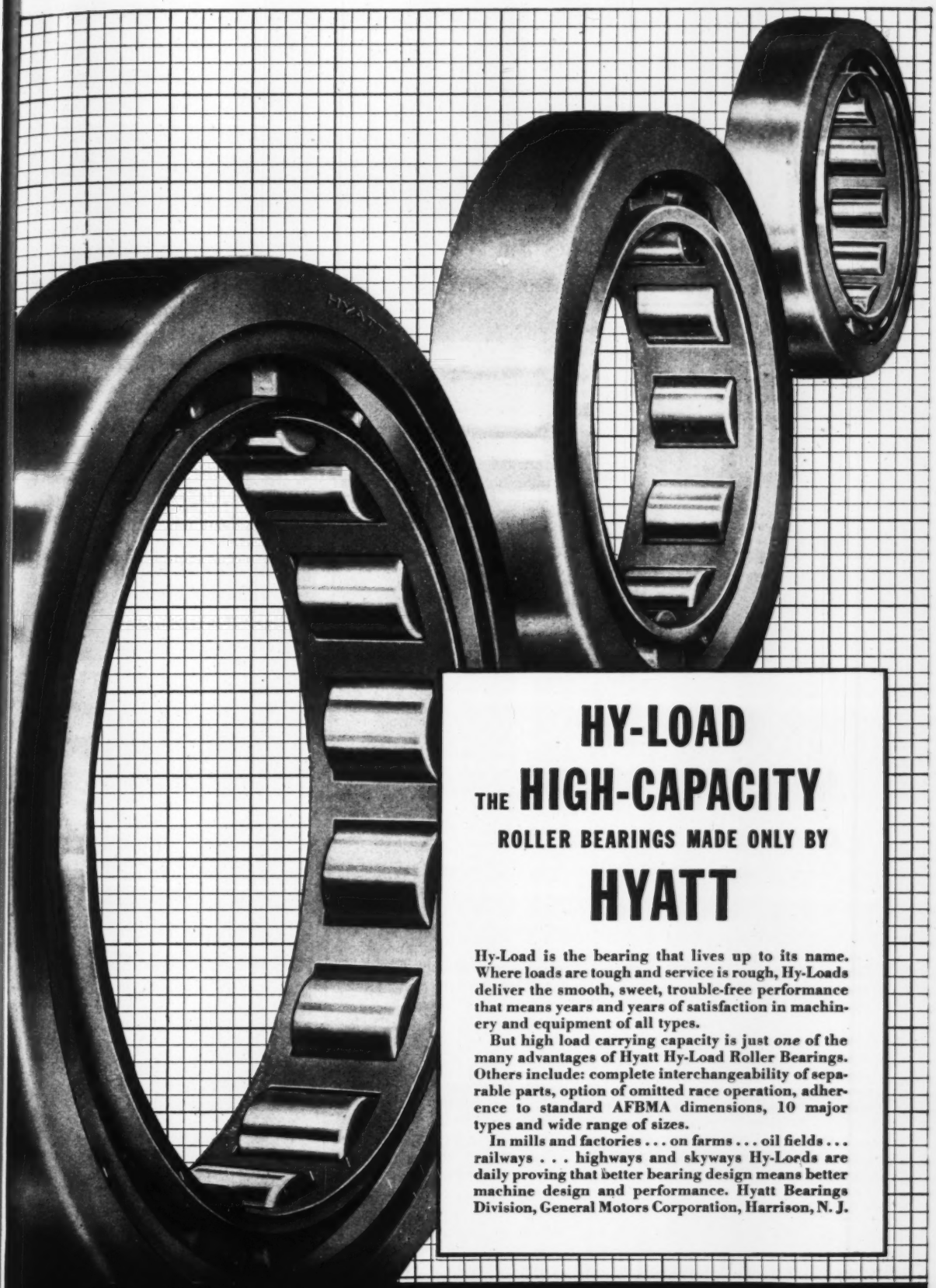
Portable Batching Plants—A colorful 24-page catalog, using more than 65 actual photographs, schematic drawings and specification charts, presents numerous cost-cutting ideas for aggregate and cement handling arrangements. Besides setting forth the general requirements for a typical roadbuilder's plant, the booklet has a complete discussion of various cement and aggregate-batching methods and equipment. Typical plant layouts are depicted in color sketches to illustrate time and labor-saving features. *The C. S. Johnson Co., Champaign, Ill.*

Variable Speed Motors—(16-p. bulletin) Presentation of new model U. S. Varidrive motors is made in a fact-filled bulletin. The Varidrive, which enables a machine operator to obtain infinite speeds, is shown in natural colors in different capacities.—*U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.*

Testing Machine—A 4-p. bulletin, No. 282, describes and illustrates Baldwin-Tate-Emery universal testing machine models 20-35 and 60-35 with respective capacities of 20,000 and 60,000 lb. These machines apply and measure loads hydraulically using precision lapped-ram construction in conjunction with three-range Tate-Emery null method dial indicators.—*Baldwin Locomotive Works, Testing Equipment Dept., Philadelphia 42, Pa.*

Waterproofing Fabric—(12-p. pamphlet) Describes advantages of an inorganic waterproofing membrane fabric, called "Glasfab," made of Fiberglas and developed as a reinforcing fabric for bituminous waterproofing compounds. The material is described as being impervious to dampness, strong and durable, unaffected by heat and not subject to capillary action that might tend to dry out the waterproofing compound. It is available in roll widths of 2-in. to 36-in.—*Lexington Supply Co., 4815 Lexington Ave., Cleveland 3, Ohio.*

Batchers—A 6-page folder on Noble weigh batchers has been released, describing three types of batching controls—manual, semi-automatic, and full-



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automatic. Dial scales, recently made optional equipment on manual and semi-automatic batchers, are included in the folder.—*Noble Co., 1860-7th St., Oakland 7, Calif.*

Belts—A new catalog section on its line of elevator belts has been published by the B. F. Goodrich Co. The section describes and pictures the various belts recommended for this service and gives pertinent data.—*The B. F. Goodrich Co., Akron, Ohio.*

Airport Drainage—(72-p. booklet) A new manual is divided into five major sections covering factors influencing design of airport drainage, design of drainage systems, airport loading, selecting drain pipe, and methods of installing pipe. Tables, charts and photographs help to simplify the written discussion. Dependable engineering data are provided on rainfall, runoff, impact loading and other matters of interest to designers.—*Armco Drainage & Metal Products, Inc., Middletown, Ohio.*

Waterproofing Admix—Two new bulletins describe the product "Hydropel," an integral waterproofing admix for concrete. One of the booklets is a 4-page leaflet which condenses the larger and more detailed bulletin.—*American Bitumuls Co., 200 Bush St., San Francisco 4, Calif.*

Surveying Instruments—An informative 4-page brochure, combining a catalog and calculating chart, has been prepared.—*C. L. Berger & Sons, Inc., Boston, Mass.*

White Fir—(56-p. booklet) The Western Pine Association announced publication of a new White Fir species book, an addition to the series of publications covering Ponderosa pine, sugar pine and Idaho white pine. The book lists in detail the properties and grades of the species and its uses in the general construction and industrial fields. Full page pictures of typical pieces of each grade are accompanied by text material describing the examples. Properties and uses sections are illustrated with photographs of white fir in actual use in residences, commercial buildings, and other uses. The book is indexed and carries a listing of standard manufactured sizes and an alphabetic catalog of uses for white fir and recommended grades therefor.—*Western Pine Association, Yeon Building, Portland 4, Ore.*

Stainless Piping Systems—"Taylor Forge Stainless" provides a new and more economical approach to flanged piping, which the manufacturers report

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to have decided advantages. A four-page, illustrated bulletin includes drawings, dimensions and prices of new type fittings and flanges, available in Stainless 304, 347, 316 and other materials.—*Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.*

Welded Erection System—An illustrated 58-page manual containing complete engineering data on the Saxe system of welded connection units for the erection of welded steel structures, written by Van Rensselaer P. Saxe, is now offered. The simple hook and eye principle of the Saxe system not only securely locks the steel members in position but its self-aligning action eliminates many hours of costly plumbing up necessary when the riveting method is employed. The manufacturer points out that the Saxe system has proved safe and dependable through wide use in many buildings of various types over a 15-year period.—*J. H. Williams & Co., 400 Vulcan Street, Buffalo 7, N. Y.*

Rock Excavation Film—A new 16 mm. film in color, with sound, featuring heavy rock excavation on four construction projects, has been prepared. Entitled, "Man against Rock," this film is purely educational and carries no advertising throughout its 33-minute run. Prints are available for showing to schools, engineering societies and others. The film shows rock drilling, blasting, mucking, etc., including the grade preparation for the new location of U. S. Highway 40 in Clear Creek Canyon between Idaho Springs and Golden, Colo. Another project is the construction of the South Dam of Grand Coulee, together with the canals and tunnels of the Columbia Basin Irrigation Project west of Spokane, Wash. A third part takes up the construction of the dams, tunnels and canals of the water distribution system of the Continental Divide Tunnel near Estes Park, Colo. The last project is the Walsh Construction Co.'s section of the Electra Tunnel near Jackson, Calif., for the Pacific Gas and Electric Co.—*Adv. Dept., Gardner-Denver Co., Quincy, Ill.*

Timber Service Bulletin—For young engineers and others who have come into industry since the war, a brochure has been prepared. It covers not only timber engineering and designing but also timber and forest products research, product development and wood chemistry. Over 20,000 copies are being distributed, including 400 to professors of engineering and architecture for distribution to students in their courses.—*Timken Engineering Co., 1319 Eighteenth St., N. W., Washington 6, D. C.*

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Motor Grader—A 24-page catalog on Galion's new extra heavy-duty motor grader is ready. Standard equipment includes manual steering with hydraulic booster, same size tires front and rear, and electric starter. With its increased weight, 100 h.p. diesel engine, all-gear tandem drive, full hydraulic control, and six 14:00x24 tires, this grader is claimed to offer the utmost in tractive effort, blade pressure, ease of handling and versatility of blading operations.—*Galion Iron Works & Mfg. Co., Galion, Ohio.*

Conveyor Belt Fasteners—A circular tells of a new line of fasteners and repair plates for heavy duty conveyor belts. So designed that they can be applied anywhere, these PLATEGRIP belt fasteners pull belt ends together into a smooth, flexible, tight joint. Made of heavy gauge steel to withstand any load the belt can safely carry, they make a smooth flush joint that easily passes under strippers. A 2-sided joint permits use of both sides of a belt. PLATEGRIP fasteners are provided for belts from ¼ in to 1½ in thickness and packaged in sets of 10 of a size to a box. Companion repair plates are also available for repairing tears and cuts or for inserting patches in worn spots.—*Armstrong Bray & Co., 5364-76 Northwest Highway, Chicago, Ill.*

Mixer—(24-p. booklet) Illustrating the use and operation of the Foote kinetic mixer, this booklet describes a new mixer that is said to answer the need for a small capacity asphalt mixing plant. Primary function of the kinetic mixer is to produce cold asphalt mixtures in quantities useful in small construction and in maintenance of asphalt streets, roads and other pavements. Mixer capacity is 25 tons per day; the machine is small and portable and can be towed behind any car or truck.—*The Foote Co., Inc., Nunda, N. Y.*

Hoisting Machinery—20-page catalog illustrates and describes a large number of hoisting items and equipment including electric, gasoline and diesel hoists, gear and chain-driven hoists, electric capstans and carpullers, boom swinging gears, hoists for special applications, and heavy duty floating derricks — *Superior-Lidgerwood-Mundy Corp., Superior, Wisc.*

Unit Structures—A 12-page catalog illustrates and describes a complete line of glued-laminated arches, trusses, beams and rafters used as roof supports for all types of buildings requiring a clear span of from 20 ft. to 200 ft. in width.—*Unit Structures, Inc., Peshtigo, Wisconsin.*

Engineering Facts about

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The Inyokern Earthquake

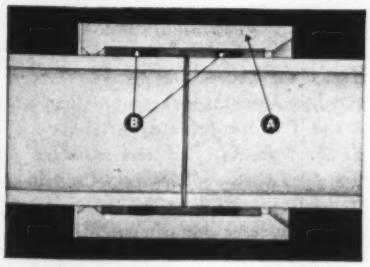
WATER LINES are seldom required to withstand a test as severe as that to which a Transite* asbestos-cement Pipe installation was subjected at Inyokern, California, about two years ago. The Transite installation at Inyokern consists of over 300,000 feet of pipe and comprises the major portion of the water supply system for the vast Naval Ordnance Test Station located there.

During the early part of 1946, an earthquake of maximum intensity occurred in the Inyokern area. Shocks of great severity were felt throughout the immediate locality in which the Transite line was laid. Naturally, concern was felt at the Naval establishment for the safety of its water supply.

After the quake had subsided, crews were dispatched to repair whatever damage the lines might have suffered. A thorough search failed to reveal a single break or any evidence of leakage at any one of the 25,000 joints in the system. Subsequent careful check of pressures and measurement of water levels confirmed that the lines had remained intact.

This aerial view shows a portion of the Naval Ordnance Test Station at Inyokern, California.

The reason this Transite installation was able to withstand this severe test is found in the inherent strength of the pipe and in the design of its Simplex Coupling, the standard coupling for Transite Pressure Pipe. Each of these couplings is a tight yet flexible link connecting one section of pipe to another and imparting to the line as a whole a degree of flexibility which enables it to "roll with the punch." Thus, shocks and vibrations are absorbed, stresses minimized to an unusual degree.



This cutaway sketch shows construction of the Simplex Coupling used with Transite Pressure Pipe. It consists of Transite sleeve "A" and two rubber rings "B" which are tightly compressed between sleeve and pipe as the coupling is assembled.

A factory-made joint which requires only assembly on the job, the Simplex Coupling derives its flexibility from its simple design. Consisting of a Transite sleeve and two rubber rings tightly compressed between pipe and sleeve, its simplicity and ease of assembly are apparent from the accompanying illustration. Moreover, this coupling is readily checked for proper assembly as the line is laid—further assurance of tightness in each individual joint and in the line as a whole.

Probably your water lines will never be called upon to absorb punishment as severe as the Transite lines at Inyokern. But the same engineering advances which protected this Transite installation can be depended on to safeguard equally well against the stresses normally encountered in water line service.

For further information about Transite Pressure Pipe, write Johns-Manville, Box 290, New York 16, N. Y.

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*Transite is a registered Johns-Manville Trade Mark

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A Nelson is easy on pavement; operator has close control of depth of cut. Hydraulic hoist and a Nelson's agility in traffic are other features you'll like.

And a Nelson is useful all year 'round. It handles coal or cinders without a change. A Nelson bucket boom, separately available, speedily converts it into a rugged loader for road or pit, handling earth, sand or broken stone.

Get the facts and costs on the Nelson—and by all means see it perform—before you invest in a snow loader. Thrifty "Utility" and big "Heavy-Duty" sizes. Write for new bulletin.

NELSON

N. P. NELSON IRON WORKS, INC.
CLIFTON, NEW JERSEY · Truck Loaders Since 1917

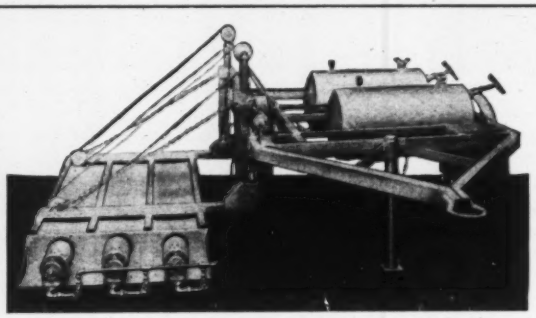
White SURFACE HEATERS

Why destroy pavement base to apply new surface?

These heaters melt 1" of old asphalt in 5 minutes. New top can be placed without damage to base.

Sizes: 6x6'; 3x6'.

Write for Catalog

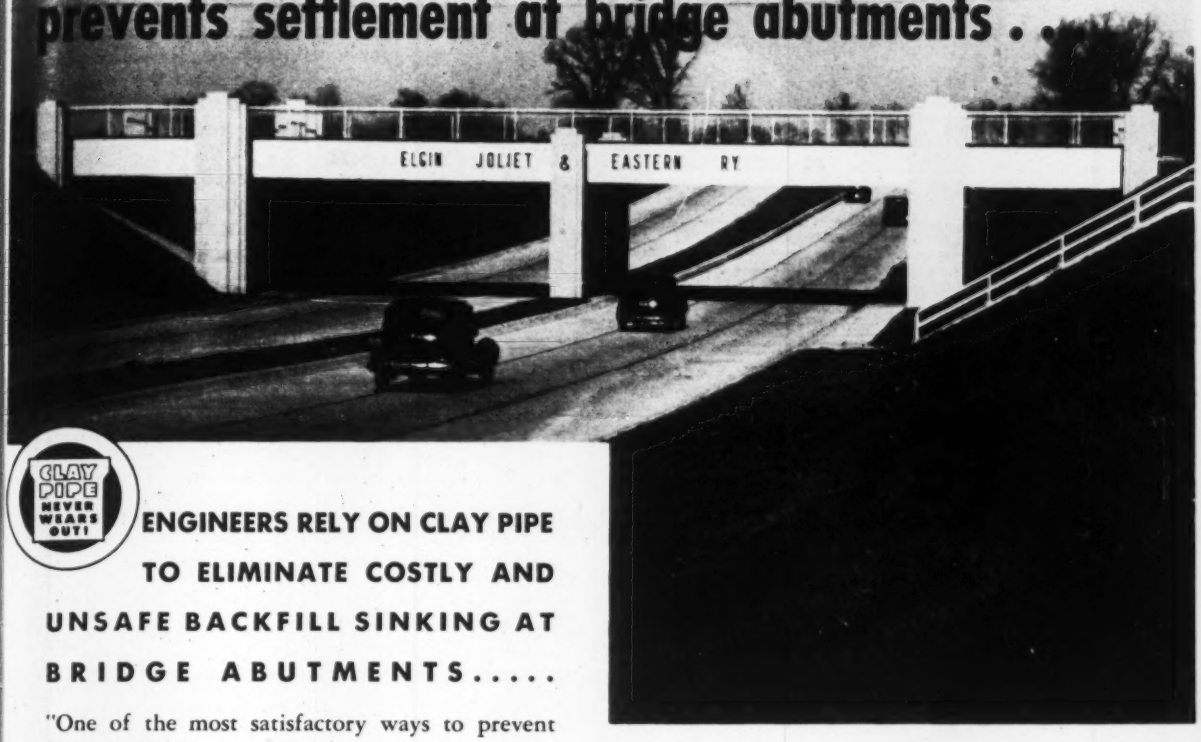


Elkhart White Mfg. Co. Indiana

Manufacturers' Activities

Sales—American Steel & Wire Co., Cleveland, Ohio, has created a new and separate sales division for electrical wire and cable products with T. N. Peterson as manager of sales, Walter E. Mackley is manager of the N. Y. district sales office. . . . H. B. Garber is now general sales manager of The Thew Shovel Co., Lorain, Ohio, and Q. J. Winsor and J. T. Cushing are assistant general sales managers. . . . Kenneth E. Sabine has become assistant sales manager in charge of advertising for the Byers Machine Co., Ravenna, Ohio. . . . Ray R. West is manager of sales for Minneapolis-Honeywell Regulator Co. products for industrial applications. . . . Everett Manufacturing Co., Inc., Phoenix, Ariz., has placed the national distribution of the Everett trenches with The Tractor Sales Corp., Los Angeles. . . . Ralph L. Wolf is central district sales manager for the Buffalo-Springfield Roller Co. of Springfield, Ohio, with headquarters at Columbus. . . . Robert H. Groman has been appointed to the board of regional sales supervisors of the Eutetic Welding Alloys Corp., 40 Worth St., N. Y. City. . . . A 10 days sales conference and instructional course was held recently by the Waterbury Tool division of Vickers, Inc., in Waterbury, Conn. . . . A. Kolsted of Kolsted Engineering and Sales Co., 33 Giralda Walk, Long Beach 3, Calif., has been made sales representative for Thomas C. Wilson, Inc., manufacturers of tube cleaning equipment. . . . David A. Werblin, a M.I.T. graduate, has been made northeastern territory sales engineer for Griffin Wellpoint Corp. . . . W. L. Manly is manager of dealer sales of the Allis-Chalmers Mfg. Co., succeeding W. A. Meyer, who has been made assistant manager of the Texrope drive department. . . . W. M. Watkins is district manager of Mack Truck's Indianapolis, Ind., branch. . . . Robert M. Vilsack has joined the sales department of Taylor Forge & Pipe Works at Chicago, Ill. . . . Ray D. Cunningham has been appointed manager of the protective coatings department, sales division of Lion Oil Co. . . . L. D. Richardson is regional sales supervisor in south central U. S. for the Eutectic Welding Alloys Corp. . . . W. W. Kemphert is vice-president in charge of sales for Skilsaw, Inc., Chicago manufacturers of portable electric tools. . . . David E. Rizor has been made assistant to John

VITRIFIED CLAY PIPE DRAINAGE prevents settlement at bridge abutments . . .



CLAY PIPE NEVER WEARS OUT!

ENGINEERS RELY ON CLAY PIPE TO ELIMINATE COSTLY AND UNSAFE BACKFILL SINKING AT BRIDGE ABUTMENTS.....

"One of the most satisfactory ways to prevent settlement of bridge abutments on spread footings is to provide *dependable* drainage . . ." says an experienced division engineer of one of America's largest railroads.

Many of the Nation's largest railroad systems are protected with Clay Pipe drainage. Their engineers, taking advantage of Clay Pipe's economy and durability, know by resulting records of reduced track-maintenance costs that they choose wisely and well.

New Perforated Clay Pipe, properly installed, is more than a match for the constant vibration and repeated shock loads it is subjected to in railroad underdrainage. Its new perforation design features smaller holes scientifically placed to handle more ground water while reducing to a minimum entrance of soil and backfill material into the line. An unobstructed pipe invert is maintained which induces faster flow, more complete drainage.

Vitrified Clay Pipe is easily handled and installed, good for generations of service, and economical in cost. It is the finest material for railroad underdrainage obtainable.

For specific information on a Clay Pipe problem, write the details to the office nearest you.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

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C-448-2

Vitrified CLAY PIPE

The Morris PORTABLE DREDGE Is EASILY MOVED From Job to Job

Engineers recommend the Morris Portable Dredge because it can be dismantled quickly and moved from one job to another with minimum expense. Does its work rapidly on inland jobs often inaccessible to regular dredging equipment. Operates with only one man, requires only two or three men for manipulating the pipe line.

You Can Use the Morris Portable Dredge on Many Inland Jobs

It cleans water storage reservoirs . . . Deepens lakes and channels . . . Restores eroded beaches . . . Fills in undesirable lowlands . . . Beautifies parks and lakes. It does not disturb solids as much as other dredges . . . nor does it cause excessive turbidity. In fact, in most cases, reservoir water is usable even during the dredging operations.

Order a Morris Portable Dredge Now

We shall be glad to send one of our experienced hydraulic dredge engineers to discuss your dredging problems with you. He will recommend the purchase of a dredge only if its use is sound, practical and economical.

Should you require a dredge, we can design and build it now complete with either electric, gasoline or Diesel engine . . . and make installation of dredge and piping all ready for operation. Furthermore, we shall furnish an operator for an initial period of time until your own dredge operator learns operation and maintenance of the dredge.

Get Full Information About Portable Dredges

Write us today for Bulletin 177 which illustrates the Portable Dredge and a wide range of other dredges.

MORRIS MACHINE WORKS • Baldwinsville, N. Y.

Sales Offices in Principal Cities

MORRIS *Centrifugal Pumps*

P. Courtright, vice-president in charge of sales for MARION POWER SHOVEL CO.

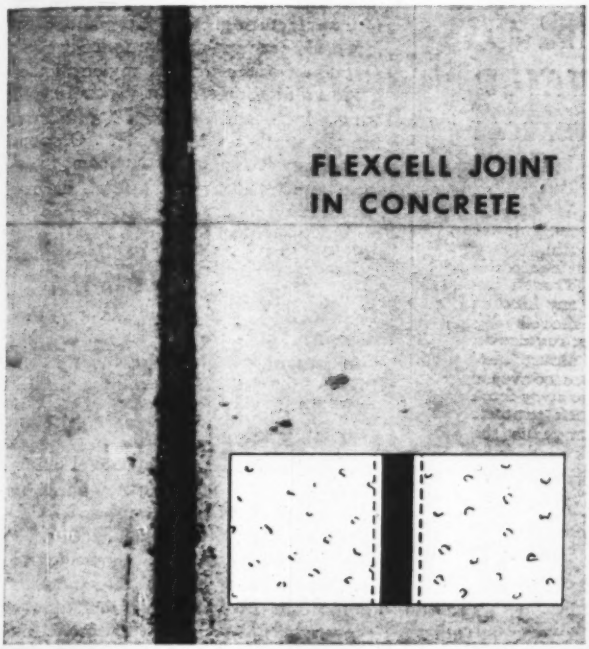
Personalities—Lawrence W. Early resident manager of the Los Angeles office of HERCULES POWDER CO.'s explosives department, has been transferred to the Salt Lake City office, and he will be succeeded at Los Angeles by Robert W. Crabtree. . . . J. A. Greenland has been appointed district manager of the Seattle, Wash., office of the DELAVAL STEAM TURBINE CO., Trenton, N. J. . . . Fred L. White, former chief engineer of the OSGOOD CO., Marion, Ohio, is now development and consulting engineer. . . . E. F. Goodner, formerly of Portland, Ore., has been appointed executive vice-president of the AMERICAN GILSONITE CO., succeeding C. F. Hansen, who has been named president of CALMARA OIL CO. of New York, subsidiary of STANDARD OIL CO. OF CALIFORNIA. At Portland, Goodner was manager of the CALIFORNIA ASPHALT CO. during construction and initial operations of the plant there. He plans to make Salt Lake City his headquarters as the AMERICAN GILSONITE CO. is located there. . . . Richard J. Sheridan has retired as president of the JOHN B. ASTELL CO., 90 West Broadway, New York, N. Y., his interests having been acquired by John B. Astell who now becomes president of the company, warehousing distributor of stainless steel pipe, tubing and accessory valves and fittings, carbon steel welding fittings and flanges, pressure vessel fittings, and boiler and condenser tubes. . . . G. L. Harman, Jr., has been made manager of the BAILEY METER CO.'s Milwaukee, Wis., branch office. . . . John R. Bergan is merchandising manager of a new department of the MINNEAPOLIS-HONEYWELL REGULATOR CO., which will supervise and coordinate advertising, merchandising and sales promotion activities. . . . Joseph L. Hegener has become secretary-treasurer of the MCCULLOCH MOTORS CORP., Los Angeles, Calif. . . . Archie Vincent, formerly structural engineer for the HENRY J. KAISER CO., has been made general manager of the C. S. JOHNSON CO., Champaign, Ill., a subsidiary of the KOEHRING CO., of Milwaukee, Wis. . . . THE FOUR WHEEL DRIVE AUTO CO., announces that Donald B. Olen, formerly chairman of the manufacturing committee, has been named director of the engineering division and H. B. Dodge, former director, has been elevated to technical adviser to the management of the company. G. D. Simonds, formerly manager of design engineering has been named chief engineer in charge of design of standard FOUR WHEEL DRIVE CO. models. B. G. Donley is the manager of

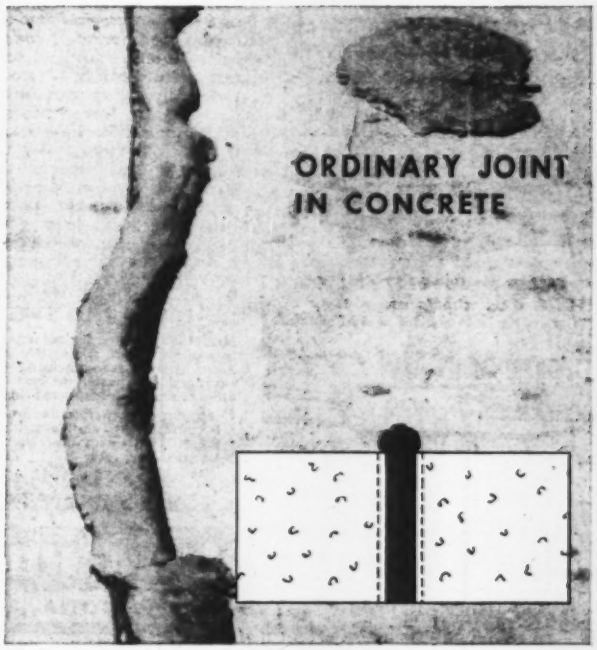
FLEXCELL

REG. U. S. PAT. OFF.

. . . first choice with engineers for

LASTING DURABILITY





CHECK THESE POINTS OF FLEXCELL SUPERIORITY

- ✓ Will not extrude under compression by adjacent concrete slabs—millions of tiny air cells permit compression without displacement.
- ✓ Resilient and re-expands when released from compression because of its wiry spring-like cane fibres. Cellular structure permits proper uniform compression.
- ✓ Durability proved by many years of actual use.
- ✓ Retains original shape while being installed, because of Celotex cane fibre board core. May be stored indefinitely. Light weight. Easily cut with hand saw.
- ✓ Adheres firmly to concrete. Provides neat finished joint.
- ✓ Made of special Celotex cane fibre board which is chemically treated during manufacture, making it toxic to fungi and termites. Protected against moisture by FLEXCELL PROCESS which coats each fibre with durable moisture-proofing compound.

AVAILABLE NOW... PROMPT SERVICE

Write for complete specifications and prices on Flexcell Bituminous Fibre Expansion Joint.

THE CELOTEX CORPORATION
CHICAGO 3, ILLINOIS

BADGER
TRENCH EXCAVATOR
FAST, CLEAN, ECONOMICAL
7 to 24 inch width
up to 11 foot depth

Pennies saved per foot of trenching assure more profit dollars per job!

Over fifty advancing speeds equip the one-man *economical* Badger Trench Excavator to operate *in and on* any kind of soil. Patented high speed shovels dig fast and uniformly . . . do not require an unwieldly, bulky machine to assure 'bite' or purchase. Reversible cross conveyor and trench shields keep waste away from trench. Overload safety clutch protects machine and prevents damage as the Badger digs forward or backward, over, under and around obstructions. Ball bearings on all high speed shafts and bronze or babbitt bearings on low speed high torque shafts assure long life dependability.

WITHOUT THE USE OF SPECIAL EQUIPMENT, dual wheels are quickly replaced by half tracks or full tracks.

25 MPH ROAD SPEED

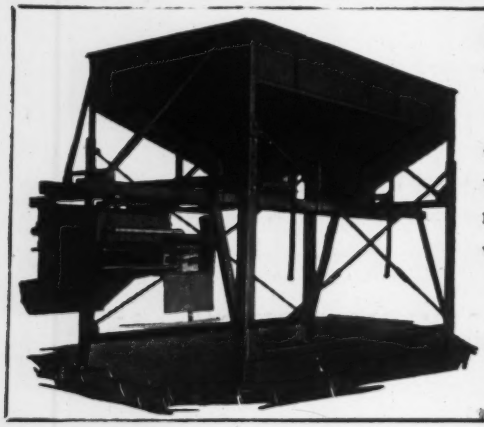
Model 202 with rear dual wheels offers cost-cutting mobility of twenty-five MPH road speed. Eight MPH is recommended speed when unit is equipped with tracks or half tracks. All Badger units are easily transported on 1½ ton truck.

Contractors, municipalities and utility companies are cutting costs and boosting profits with the Badger Trench Excavator. Let the Badger dig for profits for you, too!

Write Today **FOR COMPLETE INFORMATION**

BADGER MACHINE CO.

Dept. J WINONA, MINNESOTA



Winslow BINANBATCH —Reduces Your Job Cost

Use with a

10S-11S-14S-16S Mixer

Complete—with scale for two or three aggregates.

With two or three overhead storage bins.

For use on culvert—bridge—curbing—foundation jobs.

Wherever above size mixers are in operation

Prompt Delivery - Write or Wire

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WINSLOW SCALE CO.

TERRE HAUTE, IND.

Distributors Located throughout U. S.

development engineering on specialized products. James A. Sorenson, metallurgist for the company for more than 30 years, is now also research engineer. . . . John P. Starnes has been appointed manager of the Orlando, Fla., branch of the SOUTHERN STATES IRON ROOFING CO. . . . Three directors of LETOURNEAU (Australia) PTY. LTD. are now visiting this country. They are George E. Bryant, managing director; Leo E. Tutt, and Albert A. Losch, general manager. . . . J. J. Topolinski, works manager of SKILSAW, INC., has been elected vice-president in charge of manufacturing. . . . Harry H. Smidley has been appointed service representative for the western region of the FINDLAY division of GAR WOOD INDUSTRIES, INC.—and Byron D. Mathews for the northeast region. . . . OSGOOD and GENERAL EXCAVATOR companies have appointed Fred W. Raab as export manager.

Deceased—Neil C. Hurley, 78, chairman of the board of INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill., died Aug. 2. . . . Harry Curtis, 45, Southern representative of the PHELPS DODGE CORP., died at Birmingham, Ala., Aug. 15. . . .

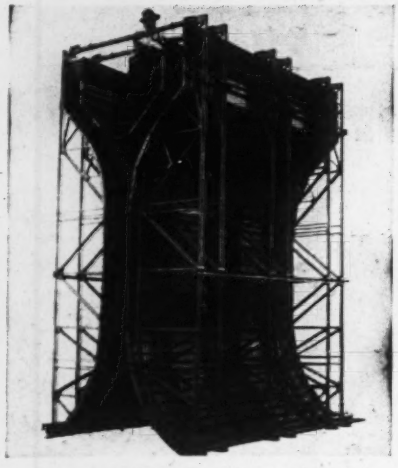
Miscellany—THE WHEELCO INSTRUMENTS CO. has opened a new office at 138 East Becher St., Milwaukee 7, Wis., with M. A. Embertson in charge. . . . ARMCO STEEL CORP. has contracted to purchase the assets of the JACKSON TUBE CO., INC., Piqua, Ohio, to be operated as the tubing division. . . . The 50th anniversary of the founding of the MARQUETTE CEMENT MFG. CO., Chicago, is now being celebrated where the company's principal plants and offices are located—LaSalle—Peru, Ill., Cape Girardeau, Mo., Des Moines, Iowa, Nashville, Tenn., and Cowan, Tenn. . . . In the next four months the LION OIL CO. will build a $250,000 plant at El Dorado, Ark., to make protective coatings exclusively. . . . The plant of the THERMOID CO. at Nephi, Utah, is now approaching 75 percent operation. . . . VULCAN RAIL & CONSTRUCTION CO., makers of pipe and bridge railing, pipe products and steel specialties, has opened a Mid-west office at 30 North La Salle St., Chicago. . . . T. J. Hodan has been named manager of the water conditioning department of ALLIS-CHALMERS. . . . Authorized industrial truck parts and service stations have been opened by the CLARK EQUIPMENT CO. at New York, Baltimore, Md., Brooklyn, N. Y., Malden, Mass., Chicago, Detroit, Indianapolis, Los Angeles, Memphis, Minneapolis, Norfolk, Va., Oakland, Calif., Philadelphia, St. Louis, Seattle and West Allis, Wis.

For ground floors that endure use **Pittsburgh** *Welded* **Reinforcement**

Your ground floor maintenance problem is reduced—the permanence of your concrete floors is assured with Pittsburgh Welded Reinforcement. This cold-drawn, high-tensile, welded steel mesh is designed to give your floors the strength they need for long service. For information on how you may obtain better floors with Pittsburgh Welded Reinforcement, write Pittsburgh Steel Products Company, 3236 Grant Building, Pittsburgh 30, Pennsylvania.

Pittsburgh Steel Products Company
Subsidiary of Pittsburgh Steel Company

Another Job Showing the ADAPTABILITY of ECONOMY STEEL FORMS



Building 8,000 feet of 20-foot wall?

That was one problem in constructing a $9 million sewage treatment plant. Walls had a cross-section as shown above, to supply aeration tanks.

Economy Engineers combined regular Economy form plates with specially designed plates, bracing and trusses, into two sets of wall forms and a center "trough" to provide a uniform 3-section form. After each pour had set, the forms were stripped as units and moved to the next setting.

Approximately half of the form plates were regular units. The balance were made specially for the job—and their cost was more than offset by savings on labor and conventional form material.

This job is another instance proving that, whatever your problem may be, when placing concrete Economy Forms will consistently produce lower over-all forming costs and higher profits.

ECONOMY FORMS CORP.

A nation-wide form rental and engineering service that saves costly material and time in concrete construction. We welcome job inquiries by wire, letter or phone.

HOME OFFICE: DES MOINES, IA.

Branch offices: Dallas, Texas; Decatur, Ga.; Fort Wayne, Ind., Metuchen, N. J.

Men and Jobs

R. H. Moore, Asheboro, N. C., consulting engineer, is supervising the construction of a 100,000-gal. water tank being built by the town of Elkin, North Carolina.

J. C. Parkin, resident engineer for the North Carolina Highway Commission at Williamston, N. C., has been named district engineer at Ahoskie, N. C.

Robert C. Hoppe, formerly city manager of Sweetwater and Midland, Tex., had been made city manager of Waco. He was educated at Rice Institute at Houston and has served as assistant district engineer for the West Texas district of the Texas Highway Department, as assistant district director for the Works Project Administration at Abilene, as city engineer for Abilene, and as construction superintendent for several big waterworks and sewerage system projects.

James A. Darling of Watrous, Sask., has been named Minister of Public Works and Telephones, Province of Saskatchewan.

H. R. Jensen, former engineer with the U. S. Army Engineers district office at Galveston, Tex., has been made principal technical assistant of R. J. Putney, Harris County flood control engineer at Houston. He has served with the Army Engineers for many years, representing them at Houston when the Addicks and Barker dams were being planned and when construction was started on them as part of the Harris County-U. S. government program for flood control. He was educated in engineering at the University of Wisconsin.

M. J. Shelton has been appointed chief engineer and general manager of the LaMesa-Lemon Grove-Spring Valley Irrigation District, San Diego County, Calif., to succeed the late Chet Harritt, whose assistant he was. He was graduated from Purdue University in 1928. Prior to the war he headed his own engineering firm in LeMesa. He entered the Army Corps of Engineers in 1942 and left the Army as a captain.

John N. Harris, Virginia highway resident engineer at Culpeper, has left to go with a construction company. **John L. Parker,** resident engineer at Sandston, will succeed Harris at Culpeper and **Elmo H. Orange,** assistant resident engineer at Fairfax, will take over the

Save time and money on CONCRETE CUTTING

• On highways, fine marbles, asphalt, brick, terrazzo, tile, or granite, results are always the same—a smooth finish and perfect 90° angles. One man can operate without previous training. Powerful enough for big jobs—economical enough for small ones. Ideal for scattered work because of ease of transporting — 5 minutes to load and unload and get it working. Let us send you descriptive circular—write

• quick
• accurate
• economical
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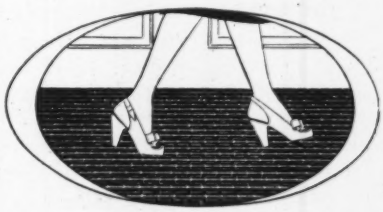
Backlin STRATEDGE CONCRETE CUTTER

DEALERS Write for information on territories we have open

BACKLIN PRODUCTS CO. BURLINGTON WISCONSIN

THE SAFE OPEN STEEL FLOORING IS TRI-LOK



No object over ½ square inch can pass through super-safe U-Type Tri-Lok Flooring. Fabricated without bolts, rivets or welds, it is unsurpassed for plant installation, walkways, loading platforms. Efficient distribution of concentrated loads . . . maximum free opening for light and air. Write for Bulletin JX 1140.

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National Distributor for the Tri-Lok Company

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Sales Representatives in Principal Cities

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1472
the
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SIX CYLINDER ENGINES
for all Heavy-Duty Power-Driven Machinery
WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.
Eastern Sales Office: Eight W. 40th St., New York 18, N. Y.
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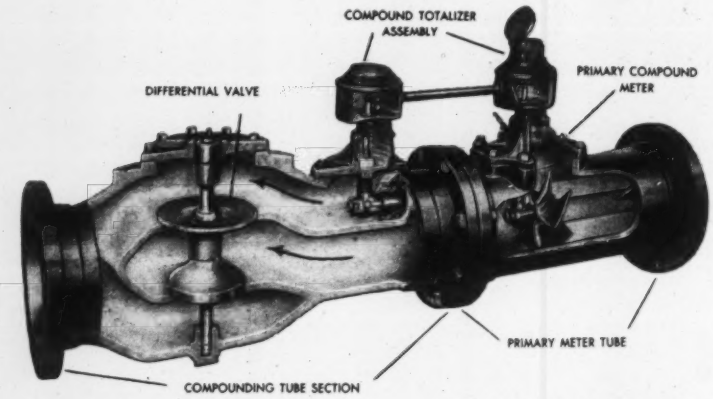
Send for this...

190-GLU Standard Gasoline Power Unit

Expanding a design already proved by arduous work-outs in industrial machinery on the job, the 190-GL Six is the result of more than 40 years of experience with a long line of engines of the same type. It's a heavy-duty 3¾ in. x 4 in., 265 cu. in. industrial six. Simple and accessible . . . rugged and rigid . . . streamlined to fit your equipment and packed with power to drive it. Built to keep from growing old—with wet cylinder sleeves and all other major parts *renewable*. Overhead valves! Advanced oiling system combines moderate pressure, metered-jet, and nozzle delivered spray. Waukesha centrifugal governor is gear driven, pressure oiled, completely enclosed. *Get the story in Bulletin 1472.*

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK TULSA LOS ANGELES

SPARLING MAIN-LINE METERS
for CONSISTENT ACCURACY



for LASTING SATISFACTION

Sparling Meters have been giving Service and Satisfaction for 28 years in waterworks, railroad and industrial water systems. You, too, will be glad you chose the Direct Action meter, complete with Totalizer as installed. Indicators, Recorders and Controls can be added as needed.

Quotation and Bulletin 310 come at your request

The COMPOUND with the Low Head Loss

The SPARLING *Manufacturers of* WATER MEASURING EQUIPMENT

Los Angeles 54.....Box 3277 Terminal Annex
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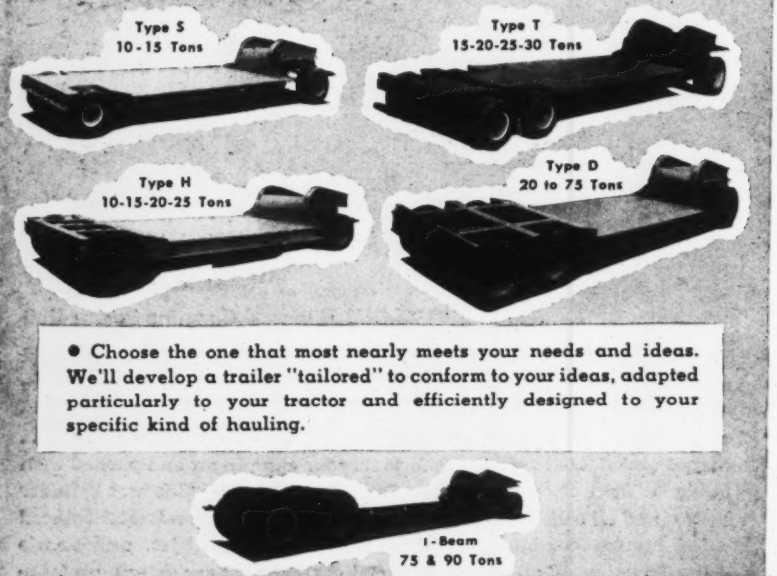
5 BASIC TYPES of ROGERS TRAILERS



• Choose the one that most nearly meets your needs and ideas. We'll develop a trailer "tailored" to conform to your ideas, adapted particularly to your tractor and efficiently designed to your specific kind of hauling.

ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
135 Orchard St., Albion, Penna.

Sandston residency. **Frank A. Howard**, engineer-inspector on the Radford bridge construction, will become assistant resident engineer at Fairfax. Harris, who has been Culpeper resident engineer since 1946, has been with the department 22 years. He attended William and Mary, V.P.I. and the Virginia Mechanics Institute and served in World War II as a lieutenant colonel in the Engineering Corps. Parker, the new Culpeper engineer, has been with the Sandston residency since 1942. He is a graduate of the Virginia Military Institute and has been with the department 25 years.

R. H. Seymour is now county engineer for Linn County, Kan.

Thomas B. Quinn is county engineer for Hamilton County, Kan.

Clark Streeter, city engineer and municipal utility superintendent of Cedar Falls, Iowa, retired recently after having been with the city for 34 years.

Fred Burket, formerly with the Pottawatomie County engineer's office at Council Bluffs, Iowa, has been named engineering aide to Forest E. Grover, city engineer.

C. J. Rhodes, senior engineer for the U. S. Engineers at Paducah, Ky., since 1931, and with the engineers for 36 years, has retired.

Hal G. Sours, former state highway director in Ohio, has been named to assist in the reorganization of the Colorado Highway Department. He is currently a consulting engineer in Columbus.

Kenneth L. Schellie, former director of the Indiana Economic Council, has been employed by Bloomington, Ind., as its new planning commissioner. A long-range program for highway development and zoning in the city and vicinity will be a part of the new commissioner's work. This is the first step in bringing the city's zoning ordinance into comformity with the requirements of the Community Planning Act passed by the legislature in 1947.

E. H. Thomas, bridge plans engineer for the Montana highway department, has resigned to enter private engineering practice.

Charles A. Ploszay, of McKeesport, has been appointed resident engineer of District 11, Pennsylvania Highways Department, with headquarters at Pittsburgh. The following have resigned: **Walter L. Mowrey,** Weedsville, resident engineer of District 2, Clearfield;

Old road made hairpin curve (center background), then curved again before reaching existing bridge. Here work on second abutment is under way.

RELOCATION on Pennsylvania's Route 29

In the interest of safety, the Pennsylvania Department of Highways recently authorized two miles of relocation on picturesque Route 29, highway running north from West Chester. Located in the Zieglersville-Schwenksville area, the project eliminates a narrow, outmoded bridge in a winding section of road by providing a new bridge with straight approaches. These scenes show phases of the construction, handled by John F. Keelor, Perkiomenville, Pa. Structural steel, bridge reinforcing, bar mats and dowel units were furnished by Bethlehem.

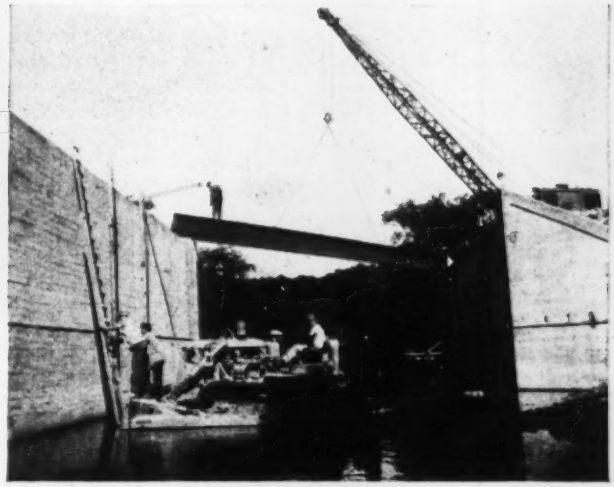
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

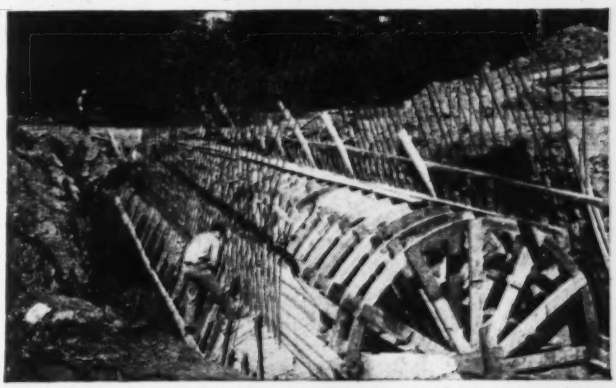
STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats
Guard Rail • Guard Rail Posts • Wire Rope and Strand
Hollow Drill Steel • Spikes • Bolts and Nuts
Pipe • Timber Bridge Hardware • Tie-Rods
Sheet and H-Piling • Fabricated Structural Steel

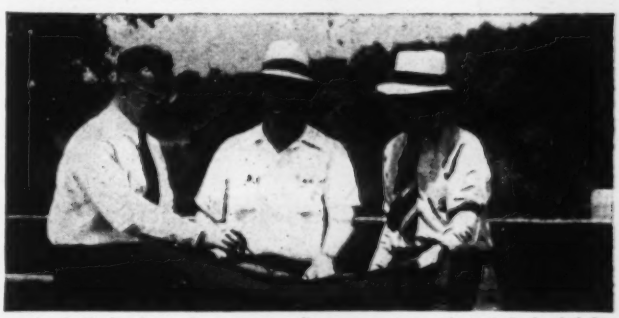
BETHLEHEM STEEL



Bethlehem Structural Steel goes into place between abutment and center pier.



Bethlehem Reintorcing Bars shown in place in one of three new culverts.



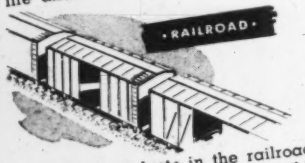
John F. Keelor (center), contractor, discusses project with A. J. Bedard (left), assistant district engineer, and Elwood Hummell (right), assistant district construction engineer, both of Pennsylvania Department of Highways.

Completed bridge ready for traffic. Structure has 180 tons of structural steel, more than 50 tons of reinforcing steel.

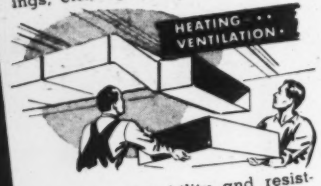
ZINC
SERVES YOU

Galvanizing (Zinc coating) insures long-time, low-cost service. For as long as iron or steel is coated with Zinc, it cannot rust. For satisfaction, use galvanized materials. They're "Sealed-in-Zinc" against rust.

TIME proves galvanized sheets stay stronger longer. Used as roofing and siding, they give buildings the "strength of steel" . . . the rust protection of Zinc. The "Seal of Quality" (above) is your guide to economy in buying galvanized sheets. It means they carry at least 2 oz. of Zinc per sq. ft. Galvanizing also lengthens fence life and service.



Galvanized products in the railroad industry guard bridges, cars, buildings, etc., against rust.



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Send me without cost or obligation the illustrated booklets I have checked.

- ☐ Repair Manual on Galvanized Roofing and Siding.
- ☐ Facts about Galvanized Sheets.
- ☐ Use of Metallic Zinc Paint to Protect Metal Surfaces.

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Town _____ State _____

Thomas D. Yeager, Moscow, Pa., district construction engineer of District 4, Scranton; **Harold A. Cunningham,** Elverson, project engineer, of district 5, Allentown.

James B. Wilson, city works director of Louisville, Ky., is resigning to give his full time to the building of houses. **B. C. Hix,** superintendent of street construction is also resigning. Wilson will be succeeded by **Thomas D. Luckett.**

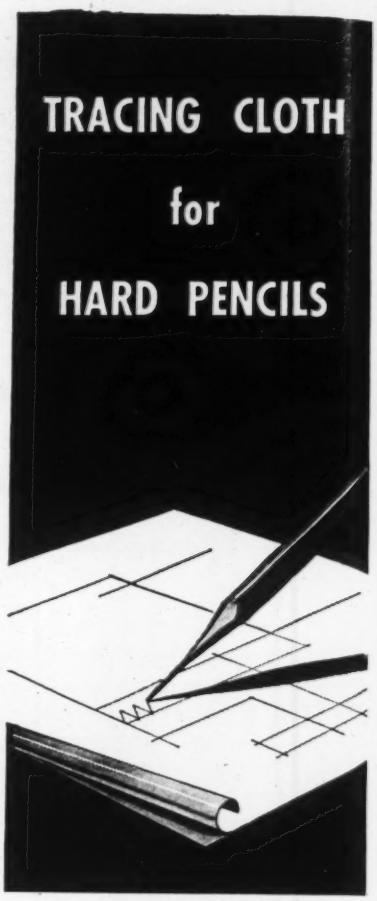
Robert C. Stuart, Jr., who recently was graduated from the new department of City and Regional Planning of the University of North Carolina at Chapel Hill, N. C., has been named city planning engineer at Knoxville, Tenn.

Col. D. A. Morris, formerly executive officer, Great Lakes Division, Corps of Engineers, Chicago, has become district engineer at Duluth, Minn., replacing Col. Frank L. Beadle retired. Colonel Morris is a civil engineer graduate of Iowa State College, 1921. A veteran of both world wars, in 1941 he took a battalion of the 21st Eng. Regiment to Iceland where he was in charge of all Air Force construction. He commanded the assault forces on Iwo Jima and later base developments from November, 1944, to January, 1946.

Col. Gerald E. Galloway, district engineer of the Little Rock, Ark., Engineer District, has been transferred to Washington, D. C. On Aug. 26 he reported to the Industrial College of the Armed Forces. **Col. Thomas A. Lane,** Corps of Engineers, will succeed Colonel Galloway at Little Rock.

Colonel Galloway has been at Little Rock since March, 1946. His first problem as district engineer was the reorganization of the district from a military mission to a large civil works program which had remained inactive and grown in need during the war. During the time that he has served as district engineer, active local flood-control projects have been under way or have been completed from Fort Smith to Pine Bluff.

Colonel Lane, who is now a member of the faculty of the Air Command and Staff School at the Maxwell Air Force Base, during the early 1930's, was an assistant to the district engineer at Memphis, when the area now covered by the Little Rock District was a part of the Memphis engineer district. Colonel Lane was graduated from West Point in 1928, and has been on various assignments with the Corps of Engineers. During the war he served on the staff of General MacArthur, for which service he was awarded the Distinguished Service Medal at the end of the war.



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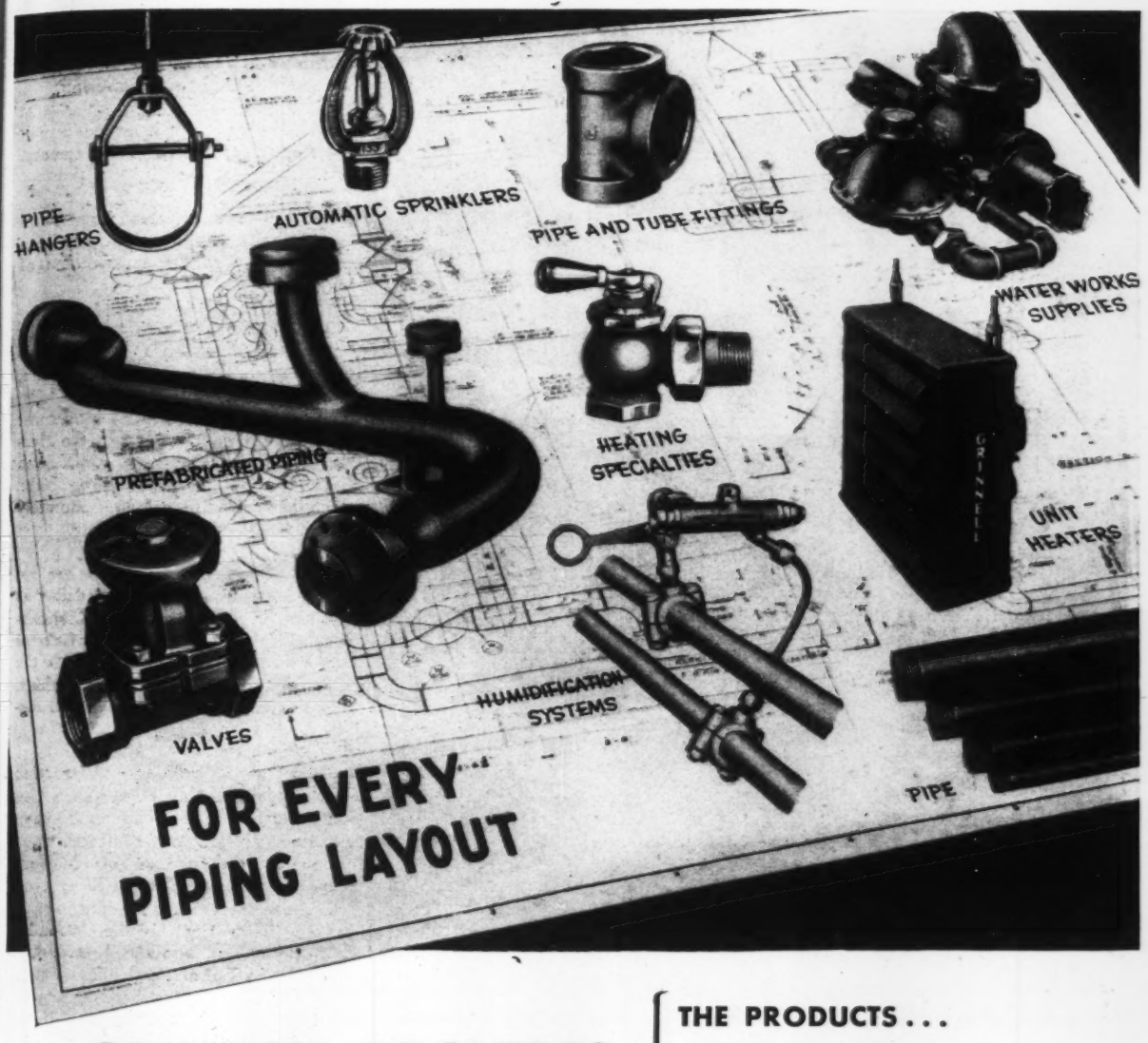

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Cleveland 14, O.	Milwaukee 3, Wis.	St. Paul, Minn.
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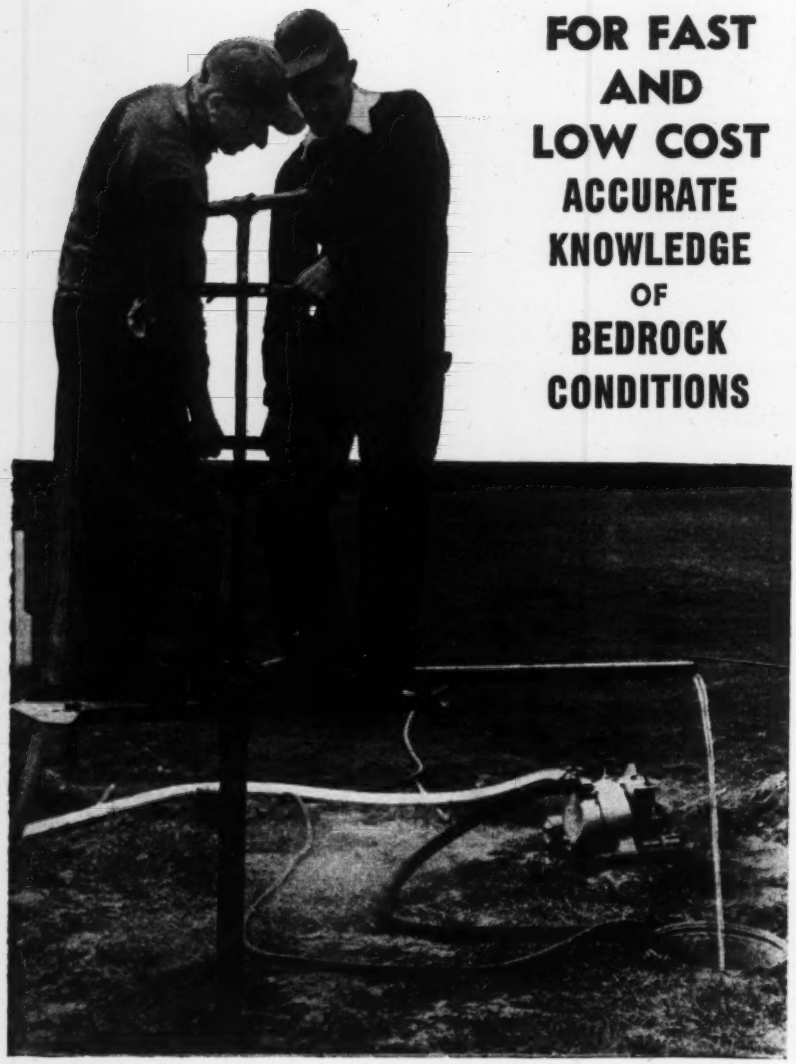

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Outfit weighs only a total of 800 lbs. for 50 ft. drilling depths. Gives accurate samples of materials drilled. Every part can be handled by one or two men. Send for descriptive circular giving complete specifications. It will help if you advise us regarding drilling depths and general nature of work.

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W. P. Pugh has been made chief engineer of the Aluminum Co. of Canada, Ltd., and **P. E. Rudley** assistant general manager in charge of engineering.

F. E. Hathway has been made resident county engineer of Tulsa County, Okla.

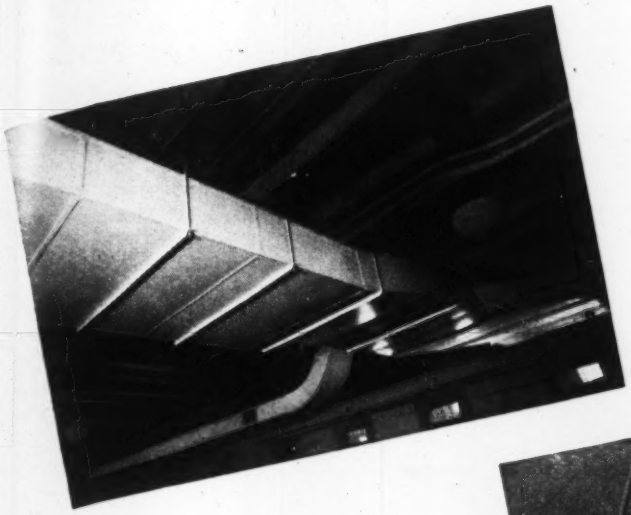
Paul V. Brown, director of parks and recreation, Indianapolis, Ind., has been appointed city park superintendent of Seattle, Wash.

Maj. C. T. Earnest, civil engineer, has been placed in charge of the Republic River area, under Col. P. D. Berrigan, district engineer, Kansas City District, Corps of Engineers. Major Earnest will supervise construction on the Harlan County Dam, on the Republican River near Republican City, Neb., which is expected to cost approximately $44,000,000.

Lt. Col. Samuel M. Lipton has replaced Lt. Col. Chester L. Landaker as executive officer of the Kansas City District Corps of Engineer. Colonel Landaker has been transferred to the University of Colorado, at Boulder, as professor of miliary science and tactics.

Robert J. Jenks, dam construction engineer for the Guy F. Atkinson Co., San Francisco, has been appointed project manager for the contractors on "step-one" construction of McNary Dam, government Columbia River project. Associated with the Atkinson company in the contract are the Ostrander Construction Co. and the J. A. Jones Construction Co. of Portland. A committee representing the three companies will control the operation, with Jenks directing the work. The new project manager worked 4½ years as an ingineer of Grand Coulee Dam construction and later was assigned to the Mud Mountain project near Seattle.

Norman H. Collisson, a civil engineer, now special assistant to the Secretary of the Interior, has been appointed deputy in the Frankfort headquarters of the Economic Cooperation Administration's Mission to Bizonal Germany. Mr. Collisson went to the Interior Department in late 1947 to assist with the European Recovery Program. Within the last twelve months he also served as chairman of a technical mission surveying German industries. Earlier, after the 1946 coal strikes, Mr. Collisson, then a captain in the Navy, became deputy administrator and then administrator for the operation of all U. S. bituminous coal mines. Mr. Collisson was a private consulting civil engineer for 15 years.



Warm air duct constructed of Apac.

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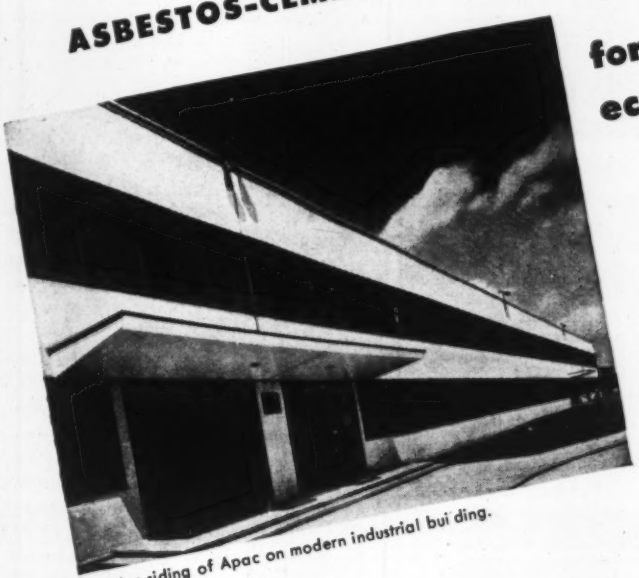
ASBESTOS-CEMENT SHEETS

for fire-resistant . . . durable . . . economical construction



Exterior siding of Apac on modern industrial bui ding.

You get long-lasting, economical construction when K&M "Century" Apac board is specified for new building, renovations or as a replacement material.

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"Century" Apac is economical on any job. Initial cost is surprisingly low. Installation costs are low because Apac is easy to cut — just score it, and snap off; easy to apply—fastens in place with nails or screws; and easy to handle—comes in sheets 4′ x 8′ and in thicknesses of 3/16″, 1/4″ and 3/8″.

For further information on how "Century" Apac can help solve your special problems, write direct to us. Your inquiry will receive prompt attention.

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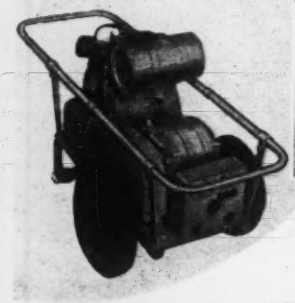

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- Will undercut at the side forms • strike off crowns, both regular and inverted • roll back for second passes.
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deeply, is not a surface treatment.

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preserves, prevents dusting of floors, surface dirt washes away in rain.

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WATERPROOFS cement paints.

OUTSIDE OR INSIDE, equally effective.

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ECONOMICAL:
comes ready to use, applied three times as fast as paint. No furring, no membraning required. Moderate price.

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office test kit, or larger sample for a field test on request.

Note: Formula No. 640 contains no paraffin, no silicate, no stearate, no linseed oil or oil of any kind.

OTHER PRODUCTS: Formula No. 640 Toxic, a combined waterproofing and termite and fungus control; cement hardener; roof coatings; floor mastics, etc.

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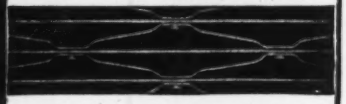
"A Fitting Grating for Every Purpose"



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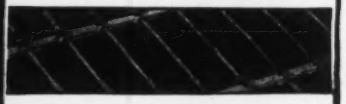

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Elections and Activities

The Engineering Committee of the new Ohio Valley Sanitation Commission was appointed by Hudson Biery, chairman, as follows: C. W. Klaasen, Springfield, Ill., chairman; F. H. Waring, Columbus, Ohio, vice-chairman; B. A. Poole, Indianapolis; K. S. Watson, Charleston, W. Va.; C. A. Holmquist, Albany, N. Y.; F. C. Dugan, Louisville, Ky.; H. E. Moses, Harrisburg, Pa., and L. L. Hedgepeth, Richmond, Va. The three federal commissioners—Col. Robert G. West, U. S. Army Engineer Corps, Cincinnati; Leonard A. Scheele, surgeon-general, U. S. Public Health Service, and O. Lloyd Meehan, of the Dept. of the Interior, both of Washington—also are members of the engineering committee.

Milton E. Goul, senior civil engineer in the New York State Department of Public Works and a lieutenant colonel in the Organized Reserve Corps, has been named commander of the 317th Engineer Construction Group, Organized Reserve Corps, Albany. He served 21 months in the European theater of war.

Seeking to prevent non-professionals from practicing as engineers, the North Carolina Society of Engineers at its summer convention at Wrightsville Beach, N. C., August 12-14 voted to seek an amendment to the State Licensing Act providing for the licensing of engineers which would change the word "engineer" to "professional engineer".

Robert E. Eby, Portland, Ore., has been appointed assistant in the technical service department of the West Coast Lumbermen's Association, working under T. K. May, director. This department keeps lumbermen informed on technical advances in wood use and works with public agencies in various phases of research. It acts as co-ordinator between the lumber industry and the U. S. Forest Service Laboratory at Madison, Wis., and laboratories at state colleges.

Engineers in Enid, Okla., have organized a club, which later will be transformed into the Enid Chapter of the Oklahoma Society of Professional Engineers. Fred W. Dennier, Garfield County engineer, was named temporary chairman, Waldo Poor, Enid, secretary, and Ross Taylor, Enid, was appointed to the steering committee. The 34 engi-

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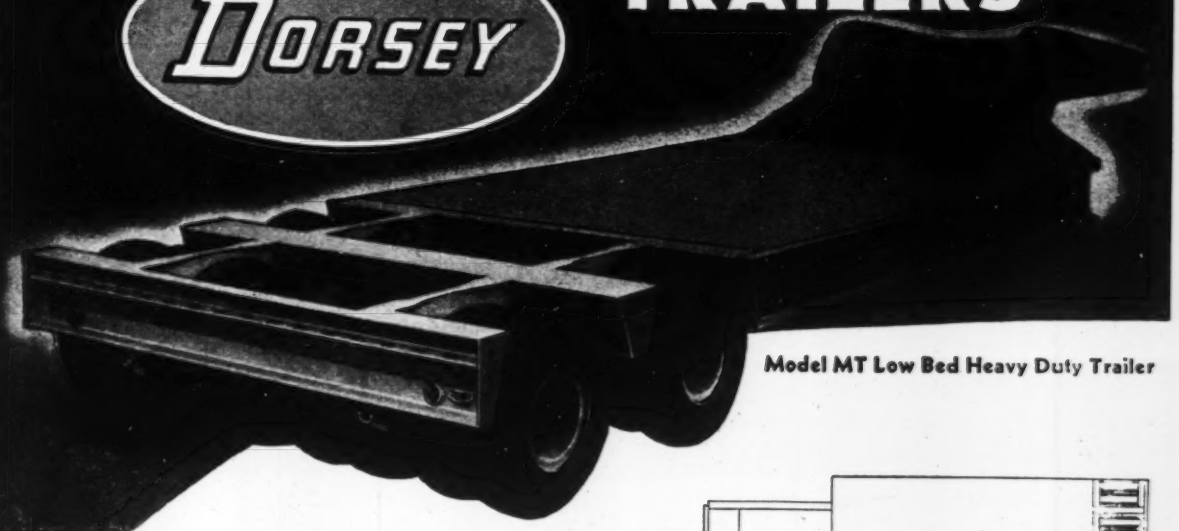
Low Bed HEAVY-DUTY TRAILERS

DORSEY



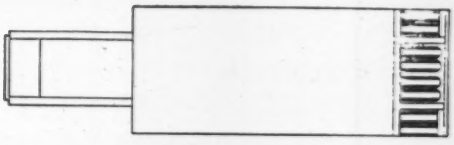
Model MT Low Bed Heavy Duty Trailer

From years of engineering experience in heavy construction comes the NEW, COMPLETELY REDESIGNED 1948 Dorsey Low Bed HEAVY DUTY TRAILERS.

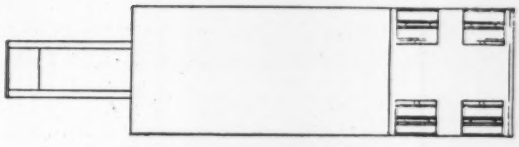
Unusually rugged, sturdy and compact, the Dorsey Low Beds will move your heaviest equipment, power shovels, tractors, cranes, or stationary machinery, with safety and efficiency.

The Dorsey Low Bed Trailers have the lowest possible center of gravity and are equipped with the safest braking system, larger models being hydraulically operated through master cylinder actuated either by air or vacuum.

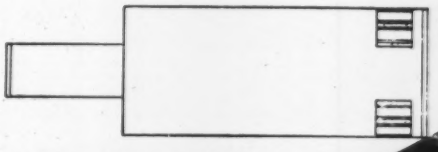
Here is a series of real Low Beds, with minimum platform height and including, as Standard Equipment, rear loading ledge, air or vacuum brake equipment, lights and reflectors and tool box.



Model M 15-20-25 Tons



Model MTS 15-20-25-30-35 Tons



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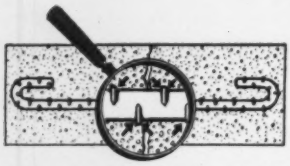
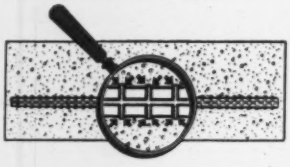


Old type reinforcing bars depend on localized anchorage.



Multi-Rib improved bars distribute anchorage and loads.

While outmoded building codes may require hooks on reinforcing bars because of the need for anchorage and bond,—for the first time in 30 years—newly developed ASTM specifications A305-47T for deformations, now assures definite anchorage with the attendant opportunity for more efficient use of steel by eliminating hooks and shortening length of embedment.

Laclede Multi-Ribbed Bars meet these specifications and are rolled to give the construction industry every advantage of steel through *balanced design* and *strength*. High yield point (in excess of 55,000 PSI) combined with maximum anchorage conserves steel tonnage for America as well as for the contractor.

Laclede Multi-Rib Reinforcing bars give strength, anchorage and balance to reinforced concrete design.

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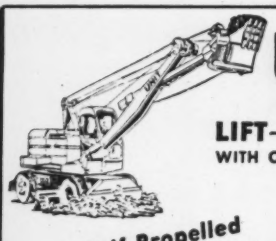

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WITH ONE OPERATOR . . . ONE ENGINE

- It's Self-Propelled
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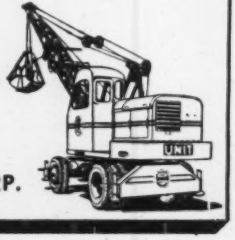

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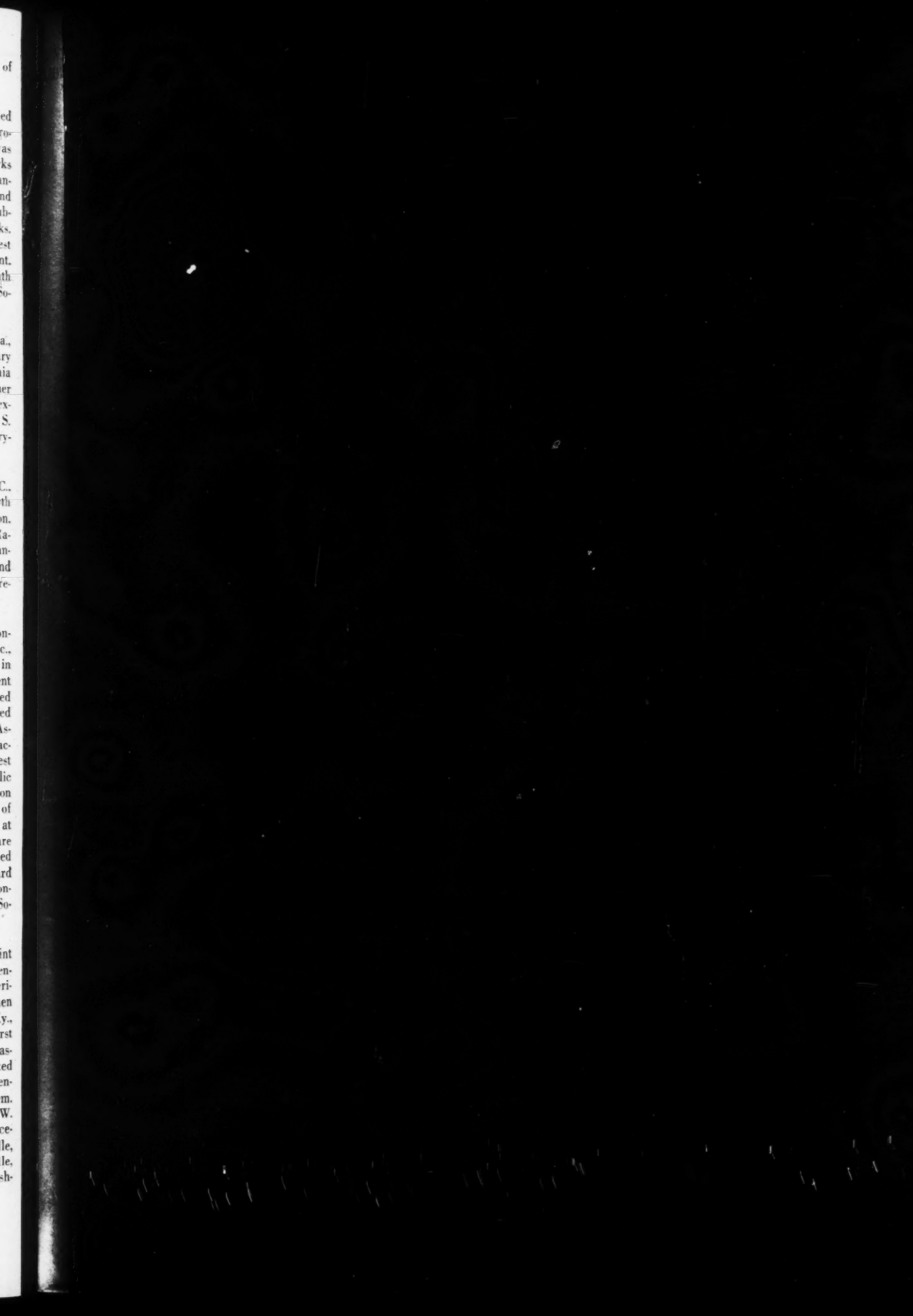
neers will meet the first Wednesday of each month.

Approximately 175 persons attended the recent convention of the South Carolina Society of Engineers. There was a tour of Charleston's new waterworks pumping station as the guests of Francis B. McDowell, Jr., engineer and manager for the Commissioners of Public Works, operators of the waterworks. There was also a visit to the West Virginia Pulp and Paper Co.'s plant. Meeting with the society was the South Carolina section of the American Society of Civil Engineers.

Lester V. Johnson, Arlington, Va., engineer, has been elected temporary president of the new Northern Virginia Society of Professional Engineers. Other officers are: Herbert Manuccia of Alexandria, vice-president; and Edward S. Holland, Jr. of Alexandria, secretary-treasurer.

L. J. Badgett, of Mt. Airy, N. C., has been elected president of the North Carolina Concrete Masonry Association. He succeeds Henry M. Shaw, of Raleigh. Other officers are: Jack Cannedy, of Henderson, vice-president, and H. J. Stockard, Jr., of Raleigh, re-elected secretary-treasurer.

At the annual meeting of the Construction Industries Association, Inc., Arthur A. Levison, vice-president in charge of the construction equipment department, Blaw-Knox Co., was elected a director. The association is affiliated with the American Road Builders' Association, constituting the manufacturers' division. It promotes the best interests of its members and the public in connection with highway construction and improvement, and in the matter of road shows and other exhibitions at which the products of its members are exhibited. Mr. Levison was also elected to membership of the Executive Board of the Committee on Concrete and Concrete Aggregates of the American Society of Testing Materials.

Precedent was broken at the joint meeting in Chattanooga of the Kentucky-Tennessee section of the American Water Works Association when Miss Lois Southerland of Paducah, Ky., was elected chairman. This is the first time in the 20-year history of the association that a woman has been elected to the post. Miss Southerland is general manager of the Paducah system. Other officers elected included R. W. Williamson, Columbia, Tenn., vice-chairman; J. W. McCoy, Madisonville, Ky., and Charles N. Bogwell, Knoxville, trustees; and R. Paul Farrell, Nashville, secretary-treasurer.